ACADEMIC REGULATIONS & COURSE STRUCTURE

For

CONTROL SYSTEMS (CS)
CONTROL ENGINEERING (CE)

(Applicable for batches admitted from 2016-2017)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Semester

S. No.	Subject	L	P	Credits
1	Advanced Control Theory	4	--	3
2	Advanced Digital Control Systems	4	--	3
3	Stochastic Estimation and Control	4	--	3
4	System and Parameter Identification	4	--	3
5	**Elective-I** i. Computer Controlled Systems ii. Control of Special Machines	4	--	3
6	**Elective-II** i. Micro Controllers& Applications ii. Process Control and Automation	4	--	3
7	Simulation Laboratory	--	4	2
Total Credits				**20**

II Semester

S. No.	Subject	L	P	Credits
1	Robotics and Control	4	--	3
2	Non-Linear Systems Analysis	4	--	3
3	Digital Signal Processing	4	--	3
4	Optimal Control Theory	4	--	3
5	**Elective-III** i. A I Techniques ii. Embedded Real Time Operating System EMS	4	--	3
6	**Elective-IV** i. Decision and Estimation Theory ii. Embedded Computer Control.	4	--	3
7	Advanced Control System Laboratory	--	4	2
Total Credits				**20**

III Semester

S. No.	Subject	L	P	Credits
1	Comprehensive Viva-Voce	**--**	**--**	2
2	Seminar – I	--	--	2
3	Project Work Part - I	--	--	16
Total Credits				**20**

IV Semester

S. No.	Subject	L	P	Credits
1	Seminar – II	--	--	2
2	Project Work Part - II	--	--	18
Total Credits				**20**

I Year - I Semester

L	P	C
4	0	3

ADVANCED CONTROL THEORY

(Common to CS & CE)

Course Educational Objectives:

- To present state models in various forms.
- To learn the concept of controllability and observability of LTI systems.
- To discuss and learn the design concepts for feedback controller and observers.

UNIT I

Introductory matrix algebra and linear vector space, State space representation of systems.Linearization of a non - linear system.Solution of state equations. Evaluation of State Transition Matrix (STM) - Simulation of state equation using MATLAB/ SIMULINK program.

UNIT II

Similarity transformation and invariance of system properties due to similarity transformations. Minimal realization of SISO, SIMO, MISO transfer functions. Discretization of a continuous time state space model.Conversion of state space model to transfer function model using Fadeeva algorithm.

UNIT III

Fundamental theorem of feedback control - Controllability and Controllable canonical form - Pole assignment by state feedback using Ackermann's formula – Eigen structure assignment problem. Observability and observable canonical form

UNIT IV

Linear Quadratic Regulator (LQR) problem and solution of algebraic Riccati equation using eigenvalue and eigen vector methods, iterative method. Controller design using output feedback.Internal stability of a system.Stability in the sense of Lyapunov, asymptotic stability of linear time invariant continuous and discrete time systems. Solution of Lyapunov type equation.

UNIT V

Duality between controllability and observability - Full order Observer based controller design. Reduced order observer design. Model decomposition and decoupling by state feedback. Disturbance rejection, sensitivity and complementary sensitivity functions. Design of full order observer using Ackermann's formula - Bass Gura algorithm.

Course Outcomes:

Aftercompletion ofthis coursethe students will be:

- Able to apply matrix algebra to develop various forms of state models.
- Able to develop and analyze physical systems.
- Able to analyze state models.
- Able to design state feedback controller and observer.

Reference Books:

1. K. Ogata, Modern Control Engineering, Prentice Hall, India 1997
2. T. Kailath, T., Linear Systems, Perntice Hall, Englewood Cliffs, NJ, 1980.
3. N. K. Sinha , Control Systems, New Age International, 3rd edition, 2005**.**
4. Panos J Antsaklis, and Anthony N. Michel, Linear Systems, New - age international (P) LTD. Publishers, 2009.
5. John J D'Azzo and C. H. Houpis , "Linear Control System Analysis and Design Conventional and Modern", McGraw - Hill Book Company, 1988.
6. B.N. Dutta, Numerical Methods for linear Control Systems - , Elsevier Publication, 2007.
7. C.T.Chen Linear System Theory and Design - PHI, India.
8. Richard C. Dorf and Robert H. Bishop, Modern Control Systems, 11th Edition, Pearson Edu, India, 2009.

ACADEMIC REGULATIONS & COURSE STRUCTURE

For

HIGH VOLTAGE ENGINEERING (HVE) & POWER SYSTEMS WITH EMPHASIS ON H. V. ENGINEERING (PSHVE)

(Applicable for batches admitted from 2016-2017)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Semester

S. No.	Subject	L	P	Credits
1	Generation and Measurement of High Voltages	4	--	3
2	Dielectric and Insulation Engineering	4	--	3
3	HVDC Transmission	4	--	3
4	Power System Operation and Control	4	--	3
5	**Elective – I** i. Artificial Intelligence Techniques ii. Advanced Digital Signal Processing iii. Smart Grid Technologies iv. Breakdown Phenomenon in Electrical Insulation	4	--	3
6	**Elective – II** i. High Voltage Power Apparatus & Diagnostics ii Collision Phenomena in Plasma Science iii. Advanced EM Fields	4	--	3
7	High Voltage Laboratory	--	4	2
Total Credits				**20**

II Semester

S. No.	Subject	L	P	Credits
1	High Voltage Testing Techniques	4	--	3
2	EHVAC Transmission	4	--	3
3	Surge Phenomenon & Insulation Coordination	4	--	3
4	Advanced Power System Protection	4	--	3
5	Elective – III i. Partial Discharge in HV Equipment ii. High Voltage systems using EMTP Analysis iii. Pulse Power Engineering	4	--	3
6	Elective – IV i. Flexible AC Transmission Systems ii. Power System Deregulation iii. Reactive Power compensation & Management	4	--	3
7	Simulation Laboratory	--	4	2
Total Credits				**20**

III Semester

S. No.	Subject	L	P	Credits
1	Comprehensive Viva-Voce	**--**	**--**	2
2	Seminar – I	--	--	2
3	Project Work Part - I	--	--	16
Total Credits				**20**

IV Semester

S. No.	Subject	L	P	Credits
1	Seminar – II	--	--	2
2	Project Work Part - II	--	--	18
Total Credits				**20**

ACADEMIC REGULATIONS & COURSE STRUCTURE

For

POWER ELECTRONICS (PE)
POWER AND INDUSTRIAL DRIVES (P&ID)
POWER ELECTRONICS AND ELECTRICALDRIVES (PE &ED)
POWER ELECTRONICS AND DRIVES (PE&D)
POWER ELECTRONICS AND SYSTEMS (PE&S)
ELECTRICAL MACHINES AND DRIVES (EM&D)

(Applicable for batches admitted from 2016-2017)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Semester

S. No.	Subject	L	P	Credits
1	Electrical Machine Modeling & Analysis	4	--	3
2	Analysis of Power Electronic Converters	4	--	3
3	Power Electronic Control of DC Drives	4	--	3
4	Flexible AC Transmission Systems	4	--	3
5	**Elective – I** i. Modern Control Theory ii. Power Quality ii. Optimization Techniques	4	--	3
6	**Elective – II** i. Energy Auditing, Conservation and Management ii. Artificial Intelligence Techniques iii. HVDC Transmission	4	--	3
7	Simulation Laboratory	--	4	2
Total Credits				**20**

II Semester

S. No.	Subject	L	P	Credits
1	Switched Mode Power Conversion	4	--	3
2	Power Electronic Control of AC Drives	4	--	3
3	Digital Controllers	4	--	3
4	Custom Power devices	4	--	3
5	**Elective – III** i. Renewable Energy Systems ii. Reactive Power Compensation & Management iii. Electrical Distribution Systems	4	--	3
6	**Elective – IV** i. Smart Grid Technologies ii. Special Machines iii Programmable Logic Controllers & Applications	4	--	3
7	Power Converters & Drives Laboratory	--	4	2
Total Credits				**20**

III Semester

S. No.	Subject	L	P	Credits
1	Comprehensive Viva-Voce	**--**	**--**	2
2	Seminar – I	--	--	2
3	Project Work Part - I	--	--	16
Total Credits				**20**

IV Semester

S. No.	Subject	L	P	Credits
1	Seminar – II	--	--	2
2	Project Work Part - II	--	--	18
Total Credits				**20**

ACADEMIC REGULATIONS & COURSE STRUCTURE

For

POWER ELECTRONICS & POWER SYSTEMS (PE&PS)

(Applicable for batches admitted from 2016-2017)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Semester

S. No.	Subject	L	P	Credits
1	Analysis of Power Electronic Converters	4	--	3
2	Digital Controllers	4	--	3
3	Reactive Power Compensation & Management	4	--	3
4	HVDC Transmission	4	--	3
5	**Elective – I** i. Renewable Energy Systems ii. Artificial Intelligence Techniques iii. Modern Control Theory	4	--	3
6	**Elective – II** i. Optimization Techniques ii. Power Quality iii. Power Semiconductor Devices & Protection	4	--	3
7	Simulation Laboratory	--	4	2
Total Credits				**20**

II Semester

S. No.	Subject	L	P	Credits
1	Switched Mode Power Conversion	4	--	3
2	Custom Power devices	4	--	3
3	Advanced Power System Protection	4	--	3
4	Flexible AC Transmission Systems	4	--	3
5	**Elective – III** i. Voltage Stability ii. Power System Deregulation iii. Power System Reliability	4	--	3
6	**Elective – IV** i. Smart Grid ii. Programmable Logic Controllers & Applications iii. Energy Auditing, Conservation and Management	4	--	3
7	Power Electronics & Power Systems Laboratory	--	4	2
Total Credits				**20**

III Semester

S. No.	Subject	L	P	Credits
1	Comprehensive Viva-Voce	**--**	**--**	2
2	Seminar – I	--	--	2
3	Project Work Part - I	--	--	16
Total Credits				**20**

IV Semester

S. No.	Subject	L	P	Credits
1	Seminar – II	--	--	2
2	Project Work Part - II	--	--	18
Total Credits				**20**

ACADEMIC REGULATIONS & COURSE STRUCTURE

For

POWER SYSTEMS (PS)
POWER SYSTEM CONTROL AND AUTOMATION (PSC&A)
POWER SYSTEM ENGINEERING (PSE)
POWER SYSTEM CONTROL (PSC)
ADVANCED POWER SYSTEMS (APS)
ELECTRICAL POWER ENGINEERING (EPE)
POWER ENGINEERING & ENERGY SYSTEMS (PE&ES)
(Applicable for batches admitted from 2016-2017)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Semester

S. No.	Subject	L	P	Credits
1	Microprocessors & Microcontrollers	4	--	3
2	HVDC Transmission	4	--	3
3	Power System Operation and Control	4	--	3
4	Reactive Power Compensation & Management	4	--	3
5	**Elective – I** i. Electrical Distribution Systems ii. EHVAC Transmission iii. Analysis of Power Electronics Converters iv. Renewable Energy Systems v. Artificial Intelligence Techniques	4	--	3
6	**Elective – II** i. Power System Security ii Advanced Digital Signal Processing iii. Generation & Measurement of High Voltages iv. Programmable Logic Controllers & Applications v. Modern Control Theory	4	--	3
7	Simulation Laboratory	--	4	2
Total Credits				**20**

II Semester

S. No.	Subject	L	P	Credits
1	Power System Dynamics and Stability	4	--	3
2	Flexible AC Transmission Systems	4	--	3
3	Real Time Control of Power Systems	4	--	3
4	Advanced Power System Protection	4	--	3
5	**Elective – III** i. Smart Grid Technologies ii. Power Quality iii. Power System Reliability iv. Voltage Stability	4	--	3
6	**Elective – IV** i. Power System Deregulation ii.High Voltage Testing Techniques iii.Power System Transients iv.Demand Side Energy Management	4	--	3
7	Power Systems Laboratory	--	4	2
Total Credits				**20**

III Semester

S. No.	Subject	L	P	Credits
1	Comprehensive Viva-Voce	**--**	**--**	2
2	Seminar – I	--	--	2
3	Project Work Part - I	--	--	16
Total Credits				**20**

IV Semester

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