SANKALCHAND PATEL UNIVERSITY
।। अथातो ज्ञानजिज्ञासा ।।

Ph. D. Program
(July-2019 Batch)

Subject Code: 1RI3000102	**Subject Title: Essentials of Disciplinary Research Subject-1** **Subject Sub-Title:** Mechanical Design of Process Systems
Pre-requisite Subject	The candidate/reader should have the background piping and pressure vessels used in process industries

Objectives of course:

- To understand the Mathematical knowledge to design pressure vessels and piping
- To understand the ability to carry of stress analysis in pressure vessels and piping

Learning outcomes:

- After completion of course, the student shall understand the mathematics for design of process system equipments.
- The student is able to analyze the pressure vessels and piping by considering stress and heat.

Teaching Scheme (Credit Distribution)				Assessment Scheme (Weightage)	
Lecture	**Tutorial**	**Practical**	**Credit**	**Hall Exam**	**Continuous Evaluation**
3	--	--	4	60%	40%

Unit	Content	Lecture	Wt. (%)
1	**Introduction** Methods for determining stresses – Terminology and Ligament Efficiency – Applications.	3	5
2	**STRESSES IN PRESSURE VESSELS** Introduction – Stresses in a circular ring, cylinder –Dilation of pressure vessels, Membrane stress Analysis of Vessel – Cylindrical, spherical and, conical heads – Thermal Stresses – Discontinuity stresses in pressure vessels.	14	35
3	**DESIGN OF VESSELS** Design of Tall cylindrical self supporting process columns – Supports for short vertical vessels – Stress concentration at a variable Thickness transition section in a cylindrical vessel, about a circular hole, elliptical openings. Theory of Reinforcement – Pressure Vessel Design.	14	35
4	**BUCKLING AND FRACTURE ANALYSIS IN VESSELS** Buckling phenomenon – Elastic Buckling of circular ring and cylinders under external pressure – collapse of thick walled cylinders or tubes under external pressure – Effect of supports on Elastic Buckling of Cylinders – Buckling under combined External pressure and axial loading.	8	15
5	**PIPING** Introduction – Flow diagram – piping layout and piping stress Analysis.	3	10

List of Reference:

1. John F. Harvey, "Theory and Design of Pressure Vessels", CBS Publishers and Distributors.
2. Henry H. Bedner, “Pressure Vessels, Design Hand Book", CBS publishers and Distributors.
3. Springer Series in Solid and Structural Mechanics
4. Pressure Vessels Design and Practices by Somnath Chattopadhyay

Review Presentation:

The student is expected to refer at least two peer reviewed journal papers related to this domain/subject. The student is expected to identify issues/challenges and emerging trends in the domain/subject. Student is supposed to explore various video lectures (E.g. NPTEL) available in the domain/subject. Student is required to make a review-presentation on the work carried out for the same.

Recommended sites for journal papers are (1) asmedigitalcollection.asme.org (2) springer.com (3) sciencedirect.com (5) ieeexplore.ieee.org (6) scholar.google.co.in or others of similar repute.

SANKALCHAND PATEL UNIVERSITY
।। अथातो ज्ञानजिज्ञासा ।।

Ph. D. Program
(July-2019 Batch)

Subject Code: 1RI3000103	**Subject Title: Essentials of Disciplinary Research Subject-2** **Subject Title:** Modeling, Simulation and Control of Non-Linear Dynamical Systems
Pre-requisite Subject	The candidate/reader should have the background mathematical modeling and basics of applied physics

Objectives of course:

- The course aims in identifying the methods of modeling and simulation.
- To understand the powerful tools which serve to indicate where both theory and experiment can be improved.
- To study the various control of non-linear dynamical system.

Learning outcomes:

- After completion of course, the student shall understand various modeling simulation and control methods of non-linear dynamical system.
- The student is able to understand the fuzzy logic, neural network and genetic algorithm in modeling and simulation in various applications.

Teaching Scheme (Credit Distribution)				Assessment Scheme (Weightage)	
Lecture	**Tutorial**	**Practical**	**Credit**	**Hall Exam**	**Continuous Evaluation**
2	--	--	2	60%	40%

Unit	Content	Lecture	Wt. (%)
1	**Introduction:** Modeling, simulation of non linear dynamic systems	6	20
2	**Fuzzy logic for modeling** 2.1 Fuzzy Set Theory 2.2 Fuzzy Reasoning 2.3 Fuzzy Inference Systems 2.4 Fuzzy Modelling	6	20
3	**Neural Networks for Control** 3.1 Backpropagation for Feed forward Networks 3.1.1 The backpropagation learning algorithm 3.1.2 Backpropagation multi layer perceptrons 3.2 Adaptive Neuro-Fuzzy Inference Systems 3.2.1 ANFIS architecture e 3.2.2 Learning algorithm 3.3 Neuro-Fuzzy Control 3.3.1 Inverse learning 3.3.2 Specialized learning 3.4 Adaptive Model-Based Neuro-Control 3.4.1 Indirect neuro-control 3.4.2 Direct neuro-control 3.4.3 Parameterized neuro-control	10	25
4	**Genetic Algorithms and Fractal Theory For Modeling and Simulation** 4.1 Genetic Algorithms	6	15

	4.2 Simulated Annealing 4.3 Basic Concepts of Fractal Theory		
5	**ADVANCED APPLICATIONS OF AUTOMATED MATHEMATICAL MODELLING AND SIMULATION** 5.1 Modelling and Simulation of Robotic Dynamic Systems 5.1.1 Mathematical modelling of robotic systems 5.1.2 Automated mathematical modelling of robotic dynamic systems 5.1.3 Automated simulation of robotic dynamic systems 5.2 Modelling and Simulation of Biochemical Reactors 5.2.1 Modelling biochemical reactors in the food industry 5.2.2 Automated mathematical modelling of biochemical reactors 5.2.3 Simulation results for biochemical reactors 5.3 Modelling and Simulation of International Trade Dynamics 5.3.1 Mathematical modelling of international trade 5.3.2 Simulation results of international trade 5.4 Modelling and Simulation of Aircraft Dynamic Systems 5.4.1 Mathematical modelling of aircraft systems 5.4.2 Simulation results of aircraft systems 5.5 Automated Mathematical Modelling of Robotic Dynamic Systems	14	20

List of Reference:

1. Modelling, Simulation and Control of Non-Linear Dynamical Systems, Taylor and Francis Inc.

Review Presentation:

The student is expected to refer at least two peer reviewed journal papers related to this domain/subject. The student is expected to identify issues/challenges and emerging trends in the domain/subject. Student is supposed to explore various video lectures (E.g. NPTEL) available in the domain/subject. Student is required to make a review-presentation on the work carried out for the same.

Recommended sites for journal papers are (1) asmedigitalcollection.asme.org (2) springer.com (3) sciencedirect.com (5) ieeexplore.ieee.org (6) scholar.google.co.in or others of similar repute.