RSET

RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY

Department of Applied Electronics & Instrumentation

RSET VISION

To evolve into a premier technological and research institution, moulding eminent professionals with creative minds, innovative ideas and sound practical skill, and to shape a future where technology works for the enrichment of mankind.

RSET MISSION

To impart state-of-the-art knowledge to individuals in various technological disciplines and to inculcate in them a high degree of social consciousness and human values, thereby enabling them to face the challenges of life with courage and conviction.

DEPARTMENT VISION

To evolve into a centre of academic excellence, developing professionals in the field of electronics and instrumentation to excel in academia and industry.

DEPARTMENTMISSION

Facilitate comprehensive knowledge transfer with latest theoretical and practical concepts, developing good relationship with industrial, academic and research institutions thereby moulding competent professionals with social commitment.

PROGRAMME EDUCATIONAL OBJECTIVES

PEOI: Graduates will possess engineering skills, sound knowledge and professional attitude, in electronics and instrumentation to become competent engineers.

PEOII: Graduates will have confidence to design and develop instrument systems and to take up engineering challenges.

PEOIII: Graduates will possess commendable leadership qualities, will maintain the attitude to learn new things and will be capable to adapt themselves to industrial scenario.

PROGRAMME OUTCOMES

Engineering Graduates will be able to:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, andan engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineeringproblems reaching substantiated conclusions using first principles of mathematics, natural sciences, andengineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and designsystem components or processes that meet the specified needs with appropriate consideration for the publichealth and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methodsincluding design of experiments, analysis and interpretation of data, and synthesis of the information toprovide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineeringand IT tools including prediction and modeling to complex engineering activities with an understanding of thelimitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal,health, safety, legal and cultural issues and the consequent responsibilities relevant to the professionalengineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions insocietal and environmental contexts, and demonstrate the knowledge of, and nee for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of theengineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverseteams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineeringcommunity and with society at large, such as, being able to comprehend and write effective reports and designdocumentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcome

Students of the program

PSO 1: will have sound technical skills in electronics and instrumentation.

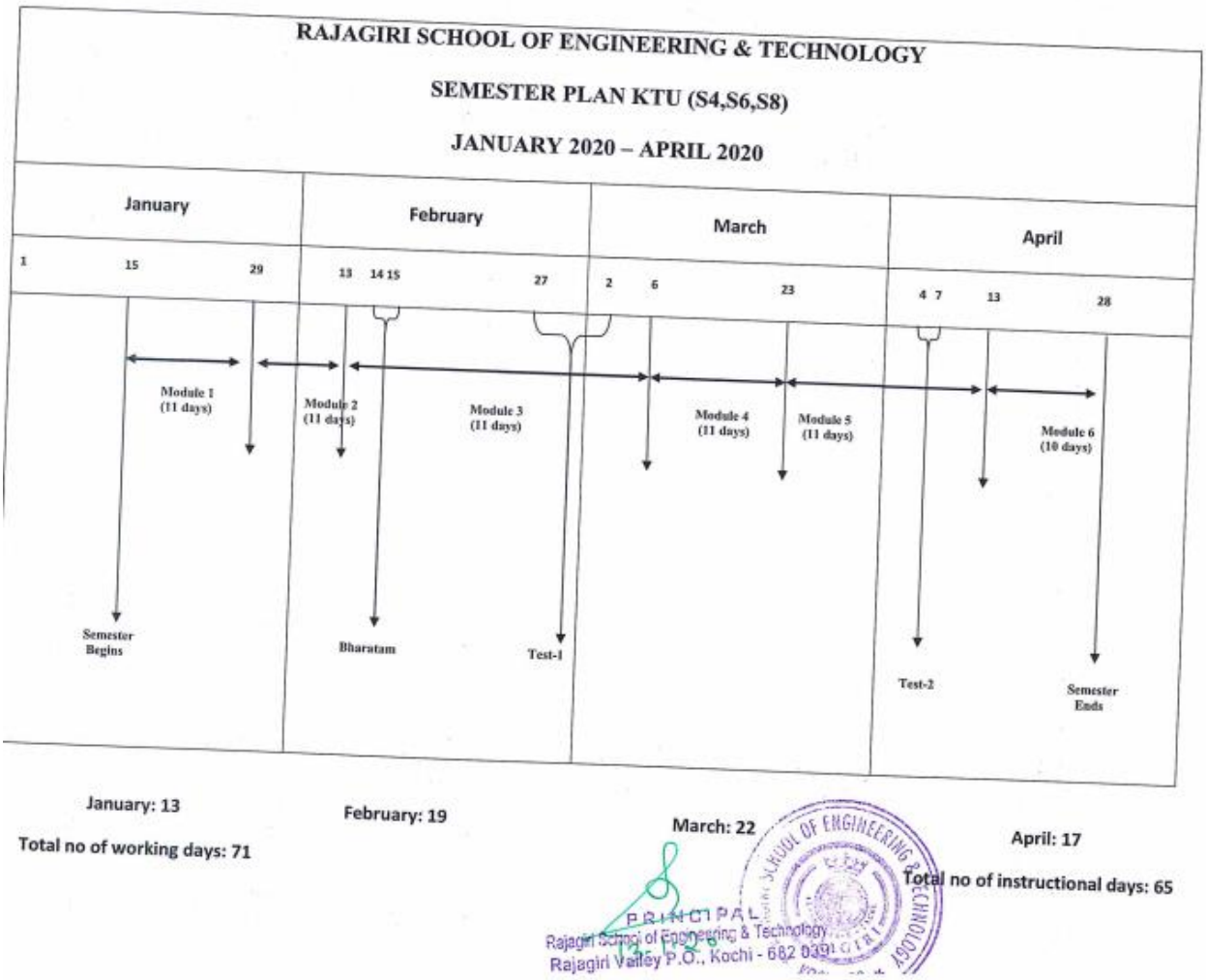
PSO 2: will be capable of developing instrument systems and methods complying with standards.

PSO 3: will be able to learn new concepts, exhibit leadership qualities and adapt to changing industrial scenarios

INDEX

ASSIGNMENT SCHEDULE	
Week 4	AE402: ANLYTICAL INSTRUMENTATION
Week 5	AE410 POWER PLANT INSTRUMENTATION
Week 5	ELECTIVE 4:AE466 INDUSTRIAL ROBOTICS
Week 6	ELECTIVE 4: AE472 PETROLEUM TECHNOLOGY
Week 7	AE402: ANLYTICAL INSTRUMENTATION
Week 8	AE410 POWER PLANT INSTRUMENTATION
Week 8	ELECTIVE 4:AE466 INDUSTRIAL ROBOTICS
Week 9	ELECTIVE 4: AE472 PETROLEUM TECHNOLOGY
Week 9	AE402: ANLYTICAL INSTRUMENTATION
Week 12	AE410 POWER PLANT INSTRUMENTATION
Week 12	ELECTIVE 4:AE466 INDUSTRIAL ROBOTICS
Week 13	ELECTIVE 4: AE472 PETROLEUM TECHNOLOGY

SEMESTER PLAN



SCHEME

BRANCH: ***Applied Electronics and Instrumentation/ Electronics and Instrumentation Engineering***

SEMESTER - 8

Course Code	*Course Name*	*L-T-P*	*Credits*	*Exam Slot*
AE402	Analytical Instrumentation	3-0-0	3	A
AE410	Power Plant Instrumentation	3-0-0	3	B
	Elective 4	3-0-0	3	C
	Elective 5 (Non Departmental)	3-0-0	3	D
AE492	Project		6	

Total Credits = 18 **Hours: 30**

Cumulative Credits= 180

Elective 4:-

1. AE462 Optimal Control System
2. AE464 Non-Linear Control System
3. AE466 Industrial Robotics
4. AE468 Nano Electronics
5. AE472 Petroleum Technology

AE402

ANALYTICAL INSTRUMENTATION

COURSE INFORMATION SHEET

PROGRAMME: Applied Electronics & Instrumentation	***DEGREE: BTECH***
COURSE: Analytical Instrumentation	*SEMESTER:* ***8th*** *CREDITS:* ***3+0+0***
COURSE CODE: AE 402 REGULATION: KTU	*COURSE TYPE:* ***CORE***
COURSE AREA/DOMAIN: Instrumentation	*CONTACT HOURS: 4 hours/Week.*
CORRESPONDING LAB COURSE CODE (IF ANY):	*LAB COURSE NAME: NIL*

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction to Analytical Instrumentation: Fundamentals of analytical instruments: Elements of an analytical instrument – PC based analytical instruments –Classification of instrumental techniques. Electromagnetic radiation- Electromagnetic spectrum- Laws relating to absorption of radiation. Absorption spectroscopy: Absorption instruments – Radiation sources- Optical filters- Monochromators- Detectors. Ultra violet and visible absorption spectroscopy.	9
II	Colorimeters/ photometers: Single beam and double beam filter photometer – Spectro photometers: Single beam and double beam spectro photo meters- Infra red spectroscopy: Basic components- Radiation sources- Monochromators- Detectors. Flame Photometry: Principle and constructional details of flame photometer- Emission system – Optical system – Detectors. Atomic absorption spectrophotometers: Theoretical concepts, Instrumentation: Radiation sources – Burners and flames – Plasma excitation sources – Optical and electronic system.	10
III	Fluorescence spectroscopy: Principle of fluorescence – Measurement of fluorescence – Single beam and double beam filter fluorimeter- Ratio fluorimeter. Spectro fluorimeters. Raman spectrometer- Basic theory- Photo acoustic spectroscopy- Photo thermal spectroscopy. Mass spectrometer: Principle of operation- Magnetic deflection mass spectrometers- Components of a mass spectrometer – Inductively coupled plasma mass spectrometer.	10
IV	Nuclear Magnetic Resonance spectroscopy: Basic principle – Constructional details of NMR spectrometer – Nuclear radiation detectors. Electron Spin Resonance spectrometer: Basic ESR spectrometer – Electron spectroscopy: Instrumentation for electron spectroscopy. X- Ray spectrometers: X – ray spectrum –Instrumentation for x –ray spectrometry. X-ray diffractometers- X-ray absorption meters- X- ray fluorescence spectrometry.	8

V	Chromatography: Chromatographic process – Classification- Terms in chromatography- Gas chromatography: Block diagram- Principle – Constructional details – Column details- GC detectors. Liquid Chromatography: Types of liquid chromatography- High pressure Liquid Chromatography (HPLC): Principle- Constructional details.	8
VI	Industrial Gas analyzers- pH meters- Conductivity meters - Dissolved oxygen meters- Sodium analyser– Gas analysers- Paramagnetic oxygen analyser – CO analysers – Flue gas analysers- Blood PH measurement – Thin film technology for gas sensors- Basic concepts. Measurement techniques and application of gas sensors. Thermal Sensors:- Radiation Sensors, Mechanical Sensors and Bio-Chemical sensors.	8
	TOTAL HOURS	53

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
1	Instrumental Methods of Analysis, Willard, Merritt, Dean, Settle, CBS Publishers & Distributors, New Delhi, Seventh edition.
2	Principles of Instrumental Analysis, Skoog, Holler, Nieman, Thomson books-cole publications, 5th edition.
3	Handbook of Analytical Instruments, R. S. Khandpur, Tata McGraw–Hill Publications, 3rd edition
4	Instrumental Methods of Chemical Analysis, Galen W. Ewing, McGraw-Hill Book Company, Fifth edition.
5	Introduction to Instrumental Analysis, Robert D. Braun, McGraw-Hill Book Company

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
1	Sensors and transducers	Covers fundamentals of instrumentation	4
2	Engineering Chemistry	Covers analytical chemistry	1

COURSE OBJECTIVES:

1	***To impart a basic knowledge about analytical instruments, its concepts, and its technique.***
2	*To give a vast knowledge about different types of spectroscopic analysis.*
3	*To study about different types of chromatographic analysis.*

COURSE OUTCOMES:

SNO	DESCRIPTION	BLOOMS' TAXONOMY LEVEL
1	Graduate will be able to **identify,** understand and **define** the fundamentals of Analytical instruments: can you **illustrate** the elements of Absorption Spectroscopy	1,3

2	Graduate will able to **sketch** various types of photometry	2,3
3	Graduates will be able to **learn** the fundamentals and applications of fluorescence spectrometers	1,3
4	Graduate will be able to **compare** and **evaluate** the performance of Mass, NMR, ESR, X-ray Spectrometers	4,5
5	Graduate will be able to **describe** and **articulate** various aspects of Gas and Liquid Chromatography	2,3
6	Graduate will be able to **deduce** the relevance with deeper understanding of Gas analyzers, pH meters, conductivity meters, Dissolved Oxygen Meters :They will be able to **choose** the appropriate method	4,6

CO-PO AND CO-PSO MAPPING

	PO1	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***	***PO12***	***PSO1***	***PSO2***	***PSO3***
CO1	*2*		*3*										*1*		
CO2			*3*				*2*							*2*	
CO3	*2*				*1*										*2*
CO4					*2*								*3*		
CO5	*3*				*2*										*2*
CO6	*3*				*2*										*2*

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

SNO	*DESCRIPTION*	*PROPOSED ACTIONS*	*RELEVANCE WITH POs*	*RELEVANCE WITH PSOs*

Mapping	Justifications
CO1-PO1	Fundamentals of analytical instrumentation requires basic knowledge of science and engineering in order to define complex engineering solutions in the field of analytical instrumentation
CO1-PO3	Consideration of health and environmental concerns are to be considered
CO1-PSO1	Have capacity of deciding the various scenario where Analytical instrumentation is applicable and necessarily used
CO2-PO3	Categorization of various types of photometry systems with their specifications is studied. It helps to find out design solutions for complex engineering problems in the fiel of analytical instrumentation and design system process.
CO2-PO 7	Selection criteria of different analytical systems takes into consideration of environmental issues and sustainable notes.
CO2-PSO2	Knowledge about the specifications of and principles of operations equips students to develop instrument system and methods complying with standards.
CO3-PO1	Considering basic engineering problems the functions of various spectrometers are studied in detail.
CO3-PO5	established technology for different types of spectrometers is well discussed
CO3-PSO3	Open discussion for new concepts and technologies and other modifications for spectrometry adept to the industrial scenario is done
CO4-PO5	Appropriate techniques, resources and modern engineering tools for analytical instrumentation are discussed. Design methods are somewhat discussed
CO4-PSO1	Technical skills for analytical instrumentation systems are reviewed.
CO5-PO1	Basic understanding of science behind Gas and Liquid Chromatography is refreshed.
CO5-PO5	Appropriate technique for Gas and liquid Chromatography is well discussed.
CO5-PSO3	Concept of chromatography and its relevance is well studied
CO6-PO1	The concept behind Gas Analyzers and its different types is well discussed
CO6-PO5	Measurement techniques and application of gas sensors is well discussed
CO6-PSO3	Technical skills for analytical sensors are reviewed.

1	*Fundamentals and methods of green analytical chemistry/instrumentation*	*Reading assignment*	*6,7,8*	*1*
2	*Detailed Applications of Analytical Instruments: Medical, Environmental, Defense and security etc.*	*Written assignment*	*1,4,6*	*1,3*
3	*Safety measures and implementation in analytical instrumentation lab*	*Reading assignment/video*	*1,2*	*1*

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

SNO	DESCRIPTION	PROPOSED ACTIONS	RELEVANCE WITH POs	RELEVANCE WITH PSOs
1	Sustainable Analytical Chemistry-concerns more than green	Written Assignment	6,7,8	1
2	Automated analytical chemistry/instrumentation	Reading assignment	1,5,12	1,3
3	Portability in analytical chemistry: green and democratic way for sustainability	Class seminar Presentation	6,7,8	1,3

WEB SOURCE REFERENCES:

1	**http://usir.salford.ac.uk/14745/1/D095810.pdf**
2	http://onlinelibrary.wiley.com/doi/10.1002/9780470511282.fmatter/pdf
3	http://www.colby.edu/chemistry/CH332/resources.htm
4	http://www.cem.msu.edu/~cem333/
5	http://web.uni-plovdiv.bg/plamenpenchev/mag/books/anchem/Handbook%20of%20Analytical%20Techniques,%202%20Volume%20Set.pdf
6	https://web-material3.yokogawa.com/Analytical_Product_BU.us.pdf
7	https://www.edinst.com/wp-content/uploads/2015/08/StellarNet-PORTA-LIBS-SPEC.pdf
8	http://faculty.rmu.edu/~short/research/antimony/references/Rouessec-F-and-Rouessec-A-2007-chemical-analysis-modern-instrumentation-methods-and-techniques-2nd-2007.pdf
9	ftp://ftp.unicauca.edu.co/Facultades/FIET/DEIC/Materias/Instrumentacion%20Industrial/Instrument_Engineers__Handbook_-_Process_Measurement_and_Analysis/Instrument%20Engineers'%20Handbook%20-%20Process%20Measurement%20and%20Analysis/1083ch8_1.pdf
10	https://www.env.go.jp/en/chemi/pops/Appendix/04-GuideLine/04Chapter3.pdf

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐ CHALK & TALK ☑	☐ STUD. ASSIGNMENT ☑	☐ WEB RESOURCES ☑	☐ LCD/SMART BOARDS☑
☐ STUD. SEMINARS☑	☐ ADD-ON COURSES		

ASSESSMENT METHODOLOGIES-DIRECT

☐ ASSIGNMENTS ☑	☐ STUD. SEMINARS	☐ TESTS/MODEL EXAMS ☑	☐ UNIV. EXAMINATION ☑
☐ STUD. LAB PRACTICES	☐ STUD. VIVA	☐ MINI/MAJOR PROJECTS	☐ CERTIFICATIONS
☐ ADD-ON COURSES	☐ OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

☐ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE) ☑	☐ STUDENT FEEDBACK ON FACULTY (TWICE) ☑
☐ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	☐ OTHERS

Prepared by
Fr. Thomas PJ
(Faculty)

Approved by
Ms. Liza Annie Joseph
(HOD)

COURSE PLAN

Sl.No	Module	Planned
1	1	Introduction to Analytical Instrumentation
2	1	Fundamentals of analytical instruments
3	1	Fluorescence spectroscopy: Principle of fluorescence
4	1	Electromagnetic radiation- Electromagnetic spectrum
5	1	Laws relating to absorption of radiation. Absorption spectroscopy
6	1	Absorption instruments – Radiation sources- Optical filters-
7	1	Monochromators- Detectors.
8	1	Ultra violet and visible absorption spectroscopy
9	1	Revision/discussion/ class
10	2	Colorimeters/ photometers: Single beam and double beam filter photometer
11	2	Spectro photometers: Single beam and double beam spectro photo meters
12	2	Infra red spectroscopy,Basic components- Radiation sources- Monochromators- Detectors
13	2	Flame Photometry: Principle and constructional details of flame photometer
14	2	Emission system – Optical system – Detectors.
15	2	Atomic absorption spectrophotometers: Theoretical concepts, Instrumentation
16	2	Radiation sources - Burners and flames
17	2	Plasma excitation sources - Optical and electronic system
18	2	Plasma excitation sources - Optical and electronic system
19	2	Revision
20	3	Fluorescence spectroscopy: Principle of fluorescence
21	3	Measurement of fluorescence – Single beam and double beam filter fluorimeter
22	3	Ratio fluorimeter. Spectro fluorimeters.
23	3	Raman spectrometer- Basic theory-
24	3	Photo acoustic spectroscopy- Photo thermal spectroscopy
25	3	Mass spectrometer: Principle of operation-
26	3	Magnetic deflection mass spectrometers
27	3	Components of a mass spectrometer
28	3	Inductively coupled plasma mass spectrometer.
29	3	Revision
30	4	Nuclear Magnetic Resonance spectroscopy: Basic principle – Constructional details of NMR spectrometer
31	4	Nuclear radiation detectors.
32	4	Electron spectroscopy: Instrumentation for electron spectroscopy
33	4	Electron Spin Resonance spectrometer: Basic ESR spectrometer

34	4	X- Ray spectrometers: X – ray spectrum –Instrumentation for x –ray spectrometry.
35	4	X-ray diffractometers- X-ray absorption meters
36	4	X- ray fluorescence spectrometry
37	4	Revision
38	5	Chromatography: Chromatographic process
39	5	Classification- Terms in chromatography
40	5	Gas chromatography: Block diagram
41	5	Principle - Constructional details
42	5	Column details- GC detectors
43	5	Liquid Chromatography: Types of liquid chromatography
44	5	High pressure Liquid Chromatography (HPLC): Principle,Constructional details
45	5	Revision
46	6	Industrial Gas analyzers- pH meters- Conductivity meters
47	6	Dissolved oxygen meters- Sodium analyser
48	6	Gas analysers- Paramagnetic oxygen analyser – CO analysers
49	6	Flue gas analysers -Blood PH measurement
50	6	Thin film technology for gas sensors- Basic concepts- Measurement techniques and application of gas sensors.
51	6	Thermal Sensors:- Radiation Sensors,
52	6	Mechanical Sensors and Bio-Chemical sensors.
53	6	Revision

Assignment Questions

Assignment I

Detailed Applications of Analytical Instruments: Medical, Environmental, Defense and security etc.

Assignment II

Sustainable Analytical Chemistry-concerns more than green analytical chemistry/Instrumentation

AE410

POWER PLANT INSTRUMENTATION

COURSE INFORMATION SHEET

PROGRAMME: **APPLIED ELECTRONICS AND INSTRUMENTATION**	DEGREE: BTECH
COURSE: **POWER PLANT INSTRUMENTATION**	SEMESTER: 8 CREDITS: 3
COURSE CODE: **AE 410** REGULATION: 2016	COURSE TYPE: CORE
COURSE AREA/DOMAIN: INSTRUMENTATION	CONTACT HOURS: 3+0 (Tutorial) hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY): NIL	LAB COURSE NAME: NIL

SYLLABUS:

UNIT	DETAILS	HOURS
I	Brief survey of methods of power generation-hydro, thermal, nuclear, solar and wind power Introduction to thermal power plant processes – building blocks - ideal steam cycles	6
II	Boiler – types, Boiler - turbine units and its range systems, feed water systems, steam circuits, air preheating. Soot blowers, combustion process, products of combustion, fuel systems, treatment of flue gases, smoke density measurements, steam turbine, condensate systems, alternator, feed water conditioning, turbine bypass valves. Importance of instrumentation in power generation – details of boiler processes, combined cycle power plant, power generation and distribution, burner tilting, and bypass damper.	7
III	Measurement in boiler and turbine: Metal temperature measurement in boilers, piping System for pressure measuring devices, smoke and dust monitor, flame monitoring. Introduction to turbine supervising system, pedestal vibration, shaft vibration, eccentricity measurement. Installation of non-contracting transducers for speed measurement.	7
IV	Measurements in power plants: Electrical measurements – current, voltage, power, frequency, power factor etc. – non electrical parameters – flow of feed water, fuel, air and steam with correction factor for temperature – steam pressure and steam temperature – drum level measurement – radiation detector – smoke density measurement – dust monitor.	7
V	Controls in boiler: Boiler drum level measurement methods, feed water control, soot blowing operation, steam temperature control, Coordinated control, boiler following mode operation, turbine following mode operation, selection between boiler and turbine following modes. Distributed control system in power plants interlocks in boiler operation. Cooling system, Automatic turbine runs up systems.	8
VI	Nuclear power plant instrumentation: Piping and instrumentation diagram of different types of nuclear power plant, Nuclear reactor control loops, reactor dynamics, pulse channel and logarithmic instrumentation,	7

	control and safety instrumentation, reliability aspects	
	TOTAL HOURS	42

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T	Gill A.B, "Power Plant Performance", Butterworth, London, 1984.
T	P.C Martin, I.W Hannah, "Modern Power Station Practice", British Electricity International Vol. 1 & VI, Pergamon Press, London, 1992.
T	Sam. G.Dukelow, "The Control of Boilers", 2nd Edition, ISA Press, New York, 1991
R	David Lindsley, "Boiler Control Systems", McGraw Hill, New York, 1991.
R	Jervis M.J, "Power Station Instrumentation", Butterworth Heinemann, Oxford, 1993.
R	Modern Power Station Practice, Vol.6, "Instrumentation, Controls and Testing", Pergamon Press, Oxford, 1971.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
AE204	Sensors and Transducers	Study the basics sensors	4
AE304	Industrial Instrumentation II	Instrumentation for measurement	6
AE302	Process Control	Familiarize with the industry	6

COURSE OBJECTIVES:

1	To introduce the basics of Power generation
2	To enable the design of power plant control using various methods

COURSE OUTCOMES:

Sl. No.	DESCRIPTION	Bloom's Taxonomy Levels
1	Graduates will be able to **describe** different power generation station and **compare** its functionality	Knowledge(1) & Understand(2)
2	Graduates will able to **prepare** P&I diagram of a boiler	Application (3)
3	Graduates will be able to **select** proper measuring equipment for the measurements of boilers and turbines.	Apply (3)
4	Graduates will be able **choose** a method for the measurement of parameters in power plant.	Application (3)

5	Graduates will able to **deduce** different control scheme for the control of boiler operation.	Application (3) & Analyze (4)
6	Graduates will able to **sketch** P&I diagrams for Nuclear power plant & reactors.	Application (3)

CO-PO AND CO-PSO MAPPING

	PO1	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	*PO11*	*PO12*	*PSO1*	*PSO2*
CO.1	*3*	-	-	*1*	-	-	-	-	-	-	-	-	*2*	-
CO.2	*2*	*3*	-	-	-	-	-	-	-	-	-	-	-	-
CO.3	-	*3*	*2*	-	-	-	-	-	-	-	-	-	-	*2*
CO.4	-	*2*	*3*	-	-	-	-	-	-	-	-	-	-	-
CO.5	*2*	-	*1*	-	-	-	-	-	-	-	-	*2*	-	*2*
CO.6	*3*	-	-	-	-	-	-	-	-	-	-	-	-	-

JUSTIFICATIONS FOR CO-PO-PSO MAPPING

MAPPING	LOW/MEDIUM/ HIGH	JUSTIFICATION
CO.1- PO1	H	Knowledge of power generation station is required for examine its functionality.
CO.1 – PO4	L	Complex problems in power generation can be examined properly
CO.1 – PSO1	M	Sound technical skill help them to describe the power generation problem.
CO.2 – PO1	M	Fundamental knowledge is appreciated for the formulation of P&I diagram.
CO.2 – PO2	H	Formulation of parameters in a boiler system required the principles of mathematics and natural sciences.
CO.2 – PSO3	M	New concepts in boiler system will be evaluated
CO.3 – PO2	H	Selection of measuring equipment requires the proper formulation of engineering problems.
CO.3 – PO3	M	Environmental considerations are to be taken care while examine the boiler system.
CO.3 – PSO2	M	Measuring equipment must be complying with industrial standard.
CO.4 – PO2	M	Identification and formulation of real engineering problem is

		required for the solution.
CO.4 – PO3	H	Design of boiler measuring system that meet the specific performance criteria.
CO.4 – PSO3	M	Better systems can be designed with the help of stability analyzing tool.
CO.5 – PO1	H	Recommend different control scheme for analysis and prediction of systems behavior.
CO.5 – PO12	M	Imparting knowledge for making industry ready graduates that enable lifelong learning.
CO.5 – PSO2	M	Understanding of universal standard analysis tool like MATLAB, students will realize the practical systems.
CO.6– PO1	H	Development of a new system require strong fundamental knowledge
CO.6– PSO3	M	Students can be adapted to the real industrial scenario.

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

Sl.NO:	*DESCRIPTION*	*PROPOSED ACTIONS*	*PO Mapping*
1	*Basics of P&I Diagrams*	*Session based on this topic planned*	*PO1, PO3, PSO2*

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

1	*Case study: Any thermal/combined cycle power plant*

WEB SOURCE REFERENCES:

1	*https://nptel.ac.in/courses/108105058/8*
2	*https://nptel.ac.in/courses/108105058/12*
3	*https://www.youtube.com/watch?v=uVPp8wml9iU*
4	*https://www.youtube.com/watch?v=Uhjhufhg3Xk*
5	*https://www.youtube.com/watch?v=IdPTuwKEfmA*
6	***https://www.youtube.com/watch?v=qSWm_nprfqE***

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑ *CHALK & TALK*	☑ *STUD. ASSIGNMENT*	☑ *WEB RESOURCES*	
☐*LCD/SMART BOARDS*	☐*STUD. SEMINARS*	☐*ADD-ON COURSES*	

ASSESSMENT METHODOLOGIES-DIRECT

☑ *ASSIGNMENTS*	☐*STUD. SEMINARS*	☑ *TESTS/MODEL EXAMS*	☑ *UNIV. EXAMINATION*
☐*STUD. LAB PRACTICES*	☐*STUD. VIVA*	☐*MINI/MAJOR PROJECTS*	☐*CERTIFICATIONS*
☐*ADD-ON COURSES*	☐*OTHERS*		

ASSESSMENT METHODOLOGIES-INDIRECT

☑ *ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)*	☑ *STUDENT FEEDBACK ON FACULTY (TWICE)*
☐*ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS*	☐*OTHERS*

Vimal kumar V

Prepared by **Approved by**

(Faculty) **(HOD)**

COURSE PLAN

Sl.No	Module	Planned	Topics
1	1	Day1	Thermal power generation
2	1	Day2	Brief survey of methods of power generation-hydro
3	1	Day3	Introduction to thermal power plant processes – building blocks - ideal steam cycles
4	1	Day4	nuclear power generation
5	1	Day5	solar power generation
6	1	Day6	wind power generation
7	2	Day7	Boiler - turbine units and its range systems,
8	2	Day8	Boiler – types
9	2	Day9	Soot blowers, combustion process, products of combustion, fuel systems
10	2	Day10	feed water systems, steam circuits, air preheating
11	2	Day11	treatment of flue gases, smoke density measurements
12	2	Day12	steam turbine, condensate systems, alternator, feed water conditioning, turbine bypass valves.
13	2	Day13	Importance of instrumentation in power generation – details of boiler processes, combined cycle power plant-power generation and distribution, burner tilting, and bypass damper
14	3	Day14	Measurement in boiler and turbine: Metal temperature measurement in boilers
15	3	Day15	Piping system for pressure measuring devices
16	3	Day16	smoke and dust monitor, flame monitoring
17	3	Day17	Introduction to turbine supervising system
18	3	Day18	pedestal vibration, shaft vibration

19	3	Day19	eccentricity measurement
20	3	Day20	Installation of non-contracting transducers for speed measurement.
21	4	Day21	Measurements in power plants: Electrical measurements – current, voltage
22	4	Day22	Measurements in power plants: Electrical measurements – power,frequency, power factor
23	4	Day23	non electrical parameters – flow of feed water
24	4	Day24	fuel, air and steam with correction factor for temperature
25	4	Day25	steam pressure and steam temperature – drum level measurement
26	4	Day26	radiation detector
27	4	Day27	smoke density measurement – dust monitor
28	4	Day28	Revision Module 4
29	5	Day29	Controls in boiler: Boiler drum level measurement methods, feed water control, soot blowing operation
30	5	Day30	steam temperature control
31	5	Day31	Coordinated control
32	5	Day32	boiler following mode operation
33	5	Day33	turbine following mode operation, selection between boiler and turbine following modes
34	5	Day34	Distributed control system in power plants interlocks in boiler operation
35	5	Day35	Automatic turbine runs up systems
36	5	Day36	Cooling system
37	6	Day37	Nuclear power plant instrumentation
38	6	Day38	Piping and instrumentation diagram of different types of nuclear power plant
39	6	Day39	Nuclear reactor control loops
40	6	Day40	reactor dynamics

41	6	Day41	control and safety instrumentation
42	6	Day42	pulse channel and logarithmic instrumentation
43	6	Day43	reliability aspects
44	6	Day44	Revision
45	5	Day45	Revision
46	6	Day46	Question paper discussion

ASSIGNMENTS

Assignment1 (Module1 & 2):

Q.No	Question
a)	Sketch the schematic of following power plants and list advantages and disadvantages i)Hydro ii)Thermal ii)Nuclear.
b)	Draw the schematic of a combined cycle power plant and write a brief description of its function near the corresponding symbol.

Assignment2 (Module5 & 6):

Q.No	*Question*
a)	*i) Explain about various control loops in boilers ii) Explain in detail about drum level control*
b)	*Explain in detail about piping and instrumentation diagram of nuclear power plant*

ELECTIVE 4

AE466

INDUSTRIAL ROBOTICS

COURSE INFORMATION SHEET

PROGRAMME: Applied Electronics and Instrumentation Engg.	**DEGREE:** BTECH
COURSE: INDUSTRIAL ROBOTICS	SEMESTER: **8** CREDITS: **3**
COURSE CODE: AE466 **REGULATION:** 2016	COURSE TYPE**: ELECTIVE**
COURSE AREA/DOMAIN: ELECTRONICS	CONTACT HOURS: **3** hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY): nil	LAB COURSE NAME: nil

SYLLABUS:

UNIT	DETAILS	HOURS
I	Automation and Robotics, Robot anatomy, configuration of robots, joint notation schemes, work volume, introduction to manipulator kinematics, position representation, forward and reverse transformations of a 2- DOF arm, a 3- DOF arm in two dimension , a 4 – DOF arm in three dimension, homogeneous transformations in robot kinematics, D-H notations, solving kinematics equations, introduction to robot arm dynamics.	7
II	Basic control system models, slew motion, joint –interpolated motion and straight line motion, controllers like on/off, proportional, integral, proportional plus integral, proportional plus derivative, proportional plus integral plus derivative.	7
III	Robot actuation and feedback components position and velocity sensors, actuators and power transmission devices, mechanical grippers , vacuum cups, magnetic grippers, pneumatic, electric , hydraulic and mechanical methods of power and control signals to end effectors.	7
IV	General considerations in robot material handling, material transfer applications, pick and place operations, palletizing and related operations, machine loading and unloading, die casting, plastic molding, forging, machining operations, stamping press operations using robots.	7
V	Robot Programming and AI: Methods - Languages -Computer control and Robot Software -VAL Language – Trajectory Planning, Basic robot motions - Point to point control & continuous path control and interpolations AI – Basics – Goals-AI Techniques – AI & Robotics.	7
VI	Robot cell layouts , multiple robots and machine interface, other considerations in work cell design, work cell control, interlocks, error detection and recovery, work cell controller, robot cycle time analysis.	7
	TOTAL HOURS	42

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T	Richard D. Klafter, Thomas A. Chmielewski and Michael Negin, "Robotic Engineering - An Integrated Approach", Prentice Hall India, 2002
R	Deb S.R., " Robotics Technology and Flexible Automation ", Tata McGraw-Hill, Publishing Co., Ltd., 1994.
R	K.S. Fu., R.C.Gonalez, C.S.G.Lee, " Robotics Control Sensing ", Vision and Intelligence, McGraw Hill International Edition, 1987.
R	Mikell P. Groover, Mitchell Weiss, "Industrial Robotics, Technology, Programming and Applications ", McGraw Hill International Editions, 1st Edition, 2000

COURSE PRE-REQUISITES: NIL

C.CODE	COURSE NAME	DESCRIPTION	SEM
	NIL		

COURSE OBJECTIVES:

1	**To familiarize automation & brief history of robot & applications.**
2	To study the kinematics of robot
3	To give knowledge about end effectors & their design
4	To learn about Robot programming methods & Languages of robot

COURSE OUTCOMES:

SNO	DESCRIPTION	Blooms' Taxonomy Level
1	Students will be equipped with the automation and **understand** the robot anatomy and manipulator kinematics (DOF) in 2D and 3D.	Understand (Level 2)
2	Students will get the **knowledge** of the basic control system models and **understand** it.	Knowledge & Understand (Level 1, 2)
3	Students will have good **knowledge** about robot actuation and feedback components like sensors, grippers and actuators and **illustrate** their usage.	Knowledge & Apply (Level 2&3)
4	Students will get the **knowledge** of robot material handling and material transfer applications.	Knowledge (Level 2)
5	Students learn about Robot programming methods & **understand** the Languages of robot.	Understand (Level 2)
6	Students will get the **knowledge** of robot cell layouts.	Understand (Level 2)

CO-PO AND CO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2

CO.1	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO.2	2	1	-	1	-	-	-	-	-	-	-	-	2	-
CO.3	2	1	-	1	-	-	-	-	-	-	-	-	2	-
CO.4	2	-	1	1	-	-	-	-	-	-	-	-	2	-
CO.5	2	-	1	1	1	-	-	-	-	-	-	-	2	-
CO.6	2	-	1	1	-	-	-	-	-	-	-	-	2	-

JUSTIFATIONS FOR CO-PO-PSO MAPPING

MAPPING	LOW/MEDIUM /HIGH	JUSTIFICATION
CO.1- PO1	M	Understands the fundamentals of robot & its applications.
CO.1 – PSO1	M	Has sound technical knowledge in electronics.
CO.1 – PSO3	L	Will be able to learn new concepts.
CO.2- PO1	M	Understands the kinematic motions of robot.
CO.2 – PO2	L	Aware of basic control system models.
CO.2 – PO4	L	Understands the motion control of robot
CO.2 – PSO1	M	Has sound technical knowledge in electronics.
CO.2 – PSO3	L	Will be able to learn new concepts.
CO.3- PO1	M	Understands the robot end effectors.
CO.3 – PO2	L	Able to illustrate their design concepts.
CO.3 – PO4	L	Able to attempt design experiments
CO.3 – PSO1	M	Has sound technical knowledge in electronics.
CO.3 – PSO3	L	Able to develop programs for various concepts.
CO.4- PO1	M	Understands the robot material handling.
CO.4- PO3	L	Able to understand material transfer applications.
CO.4- PO4	L	Understands pick and place operations, plastic molding etc.
CO.4 – PSO1	M	Has sound technical knowledge in electronics.
CO.4 – PSO3	L	Able to develop programs for various concepts.
CO.5- PO1	M	Understand the memory management unit of ARM processor.
CO.5- PO3	L	Understands the basic robot programming methods.

CO.5- PO4	L	Understands the Languages of Robot
CO.5- PO5	L	Will be aware of modern tool.
CO.5 – PSO1	M	Has sound technical knowledge in electronics.
CO.5 – PSO3	L	Able to develop programs for various concepts.
CO.6- PO1	L	Understand the basic robot cell layouts.
CO.6 – PO3	L	Understands the multiple robots and machine interface.
CO.6- PO4	L	Understands the basic cell work design.
CO.6- PS01	M	Has sound technical knowledge in electronics.
CO.6- PSO3	L	Able to provide various engineering solutions to society.

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

SNO	DESCRIPTION	PROPOSED ACTIONS	RELEVANCE WITH POs	RELEVANCE WITH PSOs
1	How to build a Robot	Reading material	PO1, PO3,PO4, PO5	PSO1

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

SNO	DESCRIPTION	PROPOSED ACTIONS	RELEVANCE WITH POs	RELEVANCE WITH PSOs
1	Human Robot Collabration	Reading material	PO1, PO3,PO4, PO5	PSO1

WEB SOURCE REFERENCES:

1	**https://www.robotshop.com/community/tutorials/show/how-to-make-a-robot-lesson-10-programming-your-robot**
2	https://www.youtube.com/watch?v=0OfXhz4In_w
3	http://www.montana.edu/dsobek/teaching/ime471/lectures/Lecture%2014b%20-%20Industrial%20Robotics%20-%20Ch%208.pdf

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐ CHALK & TALK	☐ STUD. ASSIGNMENT	☐ WEB RESOURCES
☐ LCD/SMART BOARDS	☐ **STUD. SEMINARS**	☐ **ADD-ON COURSES**

ASSESSMENT METHODOLOGIES-DIRECT

☐ ASSIGNMENTS	☐ STUD. SEMINARS	☐ TESTS/MODEL EXAMS	☐ UNIV. EXAMINATION
☐ STUD. LAB PRACTICES	☐ STUD. VIVA	☐ **MINI/MAJOR PROJECTS**	☐ CERTIFICATIONS
☐ ADD-ON COURSES	☐ OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

☐ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	☐ **STUDENT FEEDBACK ON FACULTY (TWICE)**
☐ **ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS**	☐ OTHERS

Prepared by
Abraham Thomas
(Course in-charge)

Approved by
Ms. Liza Annie Joseph
(HOD/DAEI)

COURSE PLAN

Module	Day	Planned

1	Day 1	Automation and Robotics, Robot anatomy
1	Day 2	Configuration of robots, joint notation schemes, work volume
1	Day 3	Introduction to manipulator kinematics, position representation, forward and reverse transformations of a 2- DOF arm,
1	Day 4	a 3- DOF arm in two dimension , a 4 – DOF arm in three dimension
1	Day 5	homogeneous transformations in robot kinematics,
1	Day 6	D-H notations solving kinematixcs equations
1	Day 7	solving kinematics equations, introduction to robot arm dynamics.
2	Day 8	Basic control system models, slew motion,
2	Day 9	Joint –interpolated motion and straight line motion
2	Day 10	Controllers like on/off, proportional, integral
2	Day 11	Proportional plus integral,
2	Day 12	Proportional plus derivative
2	Day 13	Proportional plus integral plus derivative.
3	Day 14	Robot actuation and feedback components
3	Day 15	position and velocity sensors, actuators and power transmission devices
3	Day 16	mechanical grippers , vacuum cups, magnetic grippers
3	Day 17	Pneumatic methods of power and control signals to end effectors.
3	Day 18	Electric methods of power and control signals to end effectors.
3	Day 19	Hydraulic methods of power and control signals to end effectors.
3	Day 20	Mechanical methods of power and control signals to end effectors.
4	Day 21	General considerations in robot material handling, material transfer applications
4	Day 22	Pick and place operations
4	Day 23	Palletizing and related operations
4	Day 24	Machine loading and unloading,
4	Day 25	Die casting, plastic molding
4	Day 26	Forging, machining operations,
4	Day 27	Stamping press operations using robots.
5	Day 28	Robot Programming and AI: Methods - Languages
5	Day 29	Computer control and Robot Software -VAL Language
5	Day 30	Trajectory Planning, Basic robot motions
5	Day 31	Point to point control & continuous path control and interpolations
5	Day 32	AI – Basics
5	Day 33	Goals-AI Techniques
5	Day 34	AI & Robotics.
6	Day 35	Robot cell layouts , multiple robots and machine interface,
6	Day 36	Other considerations in work cell design
6	Day 37	Work cell control, interlocks
6	Day 38	Error detection and recovery,
6	Day 39	Work cell controller
6	Day 40	Robot cycle time analysis.

ASSIGNMENT I

Answer all questions.

Write detailed notes on the following topics.

1. Robot Actuation and feedback components (sensors).
2. Position and velocity sensors.
3. Actuators.
4. Power transmission devices (systems).
5. Mechanical grippers.
6. Vacuum Cups.
7. Magnetic grippers.
8. Pneumatic, electric, hydraulic and mechanical methods of transmitting power and control signals to the end effectors.

Refer

1. `Industrial Robotics : Technology, Programming and Applications' by Mikell P Groover, Mitchell Weiss et.al. (chapters 3 and 5)
2. `Robotics Technology and Flexible Automation' by S R Deb.

ASSIGNMENT II

Answer all questions.

Write detailed notes on the following topics.

1. General considerations in robot material handling.
2. Material transfer applications.
3. Pick-and-place operations.
4. Palletizing and related operations.
5. Machine loading and unloading.
6. Die casting.
7. Plastic molding.
8. Forging and related operations.
9. Machining operations.
10. Stamping press operations.

Refer

1. 'Industrial Robotics : Technology, Programming and Applications' by Mikell P Groover, Mitchell Weiss et.al. (chapter 13)
2. 'Robotics Technology and Flexible Automation' by S R Deb.

ELECTIVE 4

AE472

PETROLEUM TECHNOLOGY

COURSE INFORMATION SHEET

PROGRAMME: APPLIED ELECTRONICS & INSTRUMENTATION	DEGREE: B TECH
COURSE: PETROLEUM ENGINEERING	SEMESTER: 8 CREDITS: 3
COURSE CODE: AE472 REGULATION: 2016	COURSE TYPE: Elective
COURSE AREA/DOMAIN: Process Control/Mining/Chemical/Petroleum Eng	CONTACT HOURS: 3
CORRESPONDING LAB COURSE CODE (IF ANY): NA	LAB COURSE NAME: NA

SYLLABUS:

UNIT	DETAILS	HOURS
I	Refinery products – Refinery Feeds – Crude distillation Coking and thermal process : Classification and description of some common rocks with special reference to clastic and nonclastic reservoir rocks. Origin, migration and accumulation of Petroleum. Petroleum exploration methods.	6
II	Catalytic Cracking - Catalytical hydro cracking – Hydro processing and Reused processing hydro treating. Petrophysical properties of reservoir rocks. Coring and core analysis. Reservoir fluid properties. Phase behavior of hydrocarbon system. Flow of fluids through porous media. Water and gas coning.	6
III	Well equipments. Well completion techniques. Well production problems and mitigation. Well servicing &Workover operations. Workover& completion fluids. Formation damage. Well stimulation techniques. Artificial lift techniques. Field processing of oil & gas. Storage and transportation of petroleum and petroleum products. Metering and measurements oil & gas.	7
IV	Production system analysis & optimization. Production testing. Multiphase flow in tubing and flow-lines. Nodal system analysis. Pressure vessels, storage tanks, shell and tube heat exchangers, pumps and compressors, LNG value chain.	7
V	Lubricating oil blending stocks petrochemical feedstocks. Evaluation of petro physical of sub-surface formations: Principles applications, advantages and disadvantages of SP, resistivity, radioactive, acoustic logs and types of tools used. Evaluation of CBL/VDL, USIT, SFT, RFT. Production logging tools, principles, limitations and applications.	8
VI	Special type of logging tools. Casing inspection tools (principles, applications and limitations), Formations micro scanner (FMS), NMR	8

	logging principles. Standard log interpretation methods. Cross-plotting methods. Cost Evaluation – Economic evaluation of petroleum reused and refineries. Latest trends in Petroleum Engineering: Coal bed methane, shale gas, oil shale, gas hydrate, and heavy oil.	
TOTAL HOURS		**42**

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T1	A. Lucas Hurley , Modern Petroleum Technology Upstream Vol I Edition 2002.
T2	A.G. Lucas Hurley , Modern Petroleum Technology Downstream Vol II Edition 2002
T3	J.CH Garry, Hardward G.E and M.J.Kaiser, Petroleum Refining : Technology and economics CRC Press V Edition

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
	N.A		

COURSE OBJECTIVES:

1	To impart the basic concepts of petroleum production, testing etc.
2	To impart idea on Health Safety and Environment in Petroleum Industry.
3	To update with the latest trends in Petroleum Engineering.
4	To impart some knowledge in petroleum mining and associated equipment's

COURSE OUTCOMES:

SNO	DESCRIPTION	Blooms'

		Taxonomy Level
1	To gain knowledge in petroleum engineering	Knowledge (Level 1)
2	To get knowledge in industrial safety and cost evaluation	Understand (Level 2)
3	To get knowledge in petroleum mining and associated equipment's	Apply (Level 3)
4	N.A	Analyze (Level 4)
5	N.A	Evaluate (Level 5)

CO – PO and CO – PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	P
1	X					X							x		
2			X										x		
3	X	X											x		
4															
5															

Justification

Course Outcome	Justification
CO.1-PO1&6	The syllabus cover basic aspect of petroleum mining its safety and environmental aspects
CO.2-PO3	Some design and cost evaluations of mining process covered in syllabus
CO.3-PO1&2	Typical petroleum exploration aspects and thereby economics of mining details in Module 2&4
CO.1.2.3-PSO1	This subject given only elementary knowledge more outcomes could only attained by industrial experience and there by only maps to PSO1

GAPES IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

SNO	DESCRIPTION	PROPOSED ACTIONS	RELEVANCE WITH POs	RELEVANCE WITH PSOs
1	Ant surge control of centrifugal compressor for gas /LNG pumping not given	Material Provided	PO1	PSO1

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

SNO	DESCRIPTION	PROPOSED ACTIONS	RELEVANCE WITH POs	RELEVANCE WITH PSOs
1	Petrochemical Instrumentation	Lecture	PO1	PSO1

WEB SOURCE REFERENCES:

1	https://new.abb.com/oil-and-gas/downloads
2	

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐CHALK & TALK	☐STUD. ASSIGNMENT	☐WEB RESOURCES	☐LCD/SMART BOARDS
☐STUD. SEMINARS	☐ADD-ON COURSES		

ASSESSMENT METHODOLOGIES-DIRECT

☐ASSIGNMENTS	☐STUD. SEMINARS	☐TESTS/MODEL EXAMS	☐UNIV. EXAMINATION
☐STUD. LAB PRACTICES	☐STUD. VIVA	☐MINI/MAJOR PROJECTS	☐CERTIFICATIONS
☐ADD-ON COURSES	☐OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

☐ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	☐STUDENT FEEDBACK ON FACULTY (TWICE)
☐ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	☐OTHERS

Prepared by
Mr Krishna Kumar K.P
(Faculty)

Approved by
Ms. Liza Annie Joseph
(HOD)

COURSE PLAN

Sl.No	Module	Planned
1	1	Introduction
2	1	Refinery products – Refinery Feeds – Crude distillation – Coking and thermal process :
3	1	Classification and description of some common rocks with special reference to clastic and nonclastic reservoir rocks
4	1	Classification and description of some common rocks with special reference to clastic and nonclastic reservoir rocks
5	1	Origin, migration and accumulation of Petroleum.
6	1	Petroleum exploration methods.
7	2	Catalytic Cracking
8	3	Well stimulation techniques.
9	2	Catalytical hydro cracking
10	2	Hydro processing and Reused processing hydro treating.
11	2	Petrophysical properties of reservoir rocks. Coring and core analysis.
12	2	Reservoir fluid properties
13	2	Phase behavior of hydrocarbon system.
14	2	Flow of fluids through porous media.
15	2	Water and gas coning.
16	3	Well equipments
17	3	Well completion techniques
18	3	Well production problems and mitigation.
19	3	Well servicing & Workover operations.
20	3	Workover & completion fluids.
21	3	Formation damage
22	3	Well stimulation techniques.
23	3	Artificial lift techniques. Field processing of oil & gas.
24	3	Buffer Slot
25	3	Storage and transportation of petroleum and petroleum products. Metering and measurements oil & gas.
26	4	Production system analysis & optimization
27	4	Production testing.
28	4	Multiphase flow in tubing and flow-lines
29	4	Nodal system analysis.
30	4	Pressure vessels
31	4	storage tanks, shell and tube heat exchangers,
32	4	pumps and compressors

33	4	LNG value chain.
34	4	Class Assignment
35	5	Buffer Slot
36	5	Lubricating oil blending stocks petrochemical feedstocks
37	5	Evaluation of petro physical of sub-surface formations:
38	5	Principles applications, advantages and disadvantages of SP, resistivity, radioactive, acoustic logs and types of tools used.
39	5	Principles applications, advantages and disadvantages of SP, resistivity, radioactive, acoustic logs and types of tools used.
40	5	Principles applications, advantages and disadvantages of SP, resistivity, radioactive, acoustic logs and types of tools used.
41	5	Evaluation of CBL/VDL, USIT, SFT, RFT.
42	5	Evaluation of CBL/VDL, USIT, SFT, RFT.
43	5	Production logging tools, principles, limitations and applications.
44	6	Special type of logging tools.
45	6	Casing inspection tools (principles, applications and limitations),
46	6	Formations micro scanner (FMS), NMR logging principles.
47	6	Standard log interpretation methods.
48	6	Standard log interpretation methods.
49	6	Cross-plotting methods.
50	6	Cost Evaluation – Economic evaluation of petroleum reused and refineries
51	6	Class assignment
52	6	Buffer Slot
53	6	Latest trends in Petroleum Engineering:
54	6	Coal bed methane, shale gas
55	6	oil shale, gas hydrate
56	6	heavy oil.

Assignment

1)Make a 2 page report clasticrock structures and oil reserves.

2)Class test on refinery cost estimation and shale gas mining.

AE492

PROJECT

COURSE INFORMATION SHEET

PROGRAMME: **APPLIED ELECTRONICS AND INSTRUMENTATION**	DEGREE: BTECH
COURSE: **PROJECT**	SEMESTER: 8 CREDITS: 6
COURSE CODE: **AE 492** REGULATION: 2016	COURSE TYPE: CORE
COURSE AREA/DOMAIN: INSTRUMENTATION	CONTACT HOURS: 19 hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY): NIL	LAB COURSE NAME: NIL

SYLLABUS:

UNIT	DETAILS	HOURS
I	In depth study of the topic assigned in the light of the preliminary report prepared in the seventh semester Review and finalization of the approach to the problem relating to the assigned topic Preparing a detailed action plan for conducting the investigation, including team work Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed Final development of product/process, testing, results, conclusions and future directions Preparing a paper for Conference presentation/Publication in Journals, if possible Preparing a report in the standard format for being evaluated by the dept. assessment board Final project presentation and viva voce by the assessment board including external expert	
	TOTAL HOURS	19 hours/Week

COURSE OBJECTIVES:

1	To apply engineering knowledge in practical problem solving
2	To foster innovation in design of products, processes or systems
3	To develop creative thinking in finding viable solutions to engineering problems

COURSE OUTCOMES:

Sl. No.	DESCRIPTION	Bloom's Taxonomy Levels
1	Students will be able to **apply** literature survey and **understand** research methodologies	Apply & Understand level 2 & Level 3)
2	Students get familiar with industrial standards/ notations and **define** them.	Knowledge (Level 1)
3	Graduates will be able to **understand** Project management and team working.	Understand (Level 2)
4	Graduates will be able to **analyze** and **evaluate** the construction of the application and record in their work diaries.	Analyze & Evaluate (level 4 & level 5)
5	Graduates will be able to **plan** their work like making specification list, Bill of material and Documentation ,Product spec sheets etc	Create (level 6)
6	Graduates will be able to **integrate** all the results and **conclude** their findings by publishing technical review paper on reputed Conference or Journals	Synthesis (level 5) and Evaluation (level 6)

CO-PO AND CO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO.1	2	3	1	3	-	1	-	-	-	2	-	2	2	-
CO.2	2	-	-	-	2	-	-	-	-	-	-	-	2	2
CO.3	-	-	-	-	-	1	1	1	3	2	3	2	-	-
CO.4	2	3	-	-	-	1	-	-	-	-	-	1	2	2
CO.5	2	-	-	3	-	-	-	-	-	-	3	2	2	-
CO.6	2	-	-	-	-	-	-	-	-	2	-	-	-	-

JUSTIFATIONS FOR CO-PO-PSO MAPPING

MAPPING	LOW/MEDIUM/ HIGH	JUSTIFICATION
CO.1-PO1	M	Understands the how to apply engineering fundamentals already learnt.
CO.1 – PO2	H	Able to formulate solutions based on the review of literature survey
CO.1 – PO3	L	Will be able to design solutions for problems arises.

CO.1- PO4	M	Understands the research methodology from the literature survey.
CO.1- PO6	L	Will be able to apply knowledge gained to access various engineering practice.
CO.1 – PO10	M	Gets the demonstration knowledge of their work done.
CO.1 – PO12	M	With research methodologies students get the ability to engage in technological change.
CO.1- PSO1	M	Gets technical skills in electronics.
CO.1- PSO3	L	Literature survey helps to understand the new concepts.
CO.2-PO1	M	Understands the application of engineering specialization.
CO.2- PO5	M	Get used with the engineering standards defined.
CO.2 – PSO2	M	Familiarization of the industrial standards.
CO.2 – PSO1	M	Aware of modern tools in the trend.
CO.3 – PO6	L	Project management skill is developed.
CO.3-PO7	L	Team management skill is developed.
CO.3 – PO8	L	With project management skill students understands the professional ethics.
CO.3- PO9	H	Understands how to work efficiently in multidisciplinary settings.
CO.3 – PO10	M	Development of communication skill.
CO.3- PO11	H	Understand the project management principles.
CO.3 – PO12	M	Acquire the ability to the context of technological change.
CO.3 – PSO3	M	Students exhibit leadership quality and understand how to work in team.
CO.4-PO1	M	Ability to analyze and evaluate the applications.
CO.4-PO2	H	Various analysis and synthesis methods are being handled to solve the practical problems.
CO.4-PO6	L	The product being developed is done with the responsibility to societal focus.
CO.4 – PO12	L	Acquire the ability to the context of technological change
CO.4- PSO1	M	Acquire knowledge in the electronics and instrumentation.
C0.4 – PSO2	M	Students get confidence to develop instrument systems
CO.4-PSO3	L	Learning of new concepts in various aspects is done.
CO.5-PO1	M	Ability to plan, analyze and evaluate the applications.
CO.5-PO4	H	Valid conclusion of their work is done.

CO.5-PO11	H	Making of spread sheets for the various project components is studied and done.
CO.5 - PO12	M	Acquire the ability to the context of technological change
CO.5 – PSO1	M	Acquire knowledge in the electronics and instrumentation.
CO.6 – PO1	M	Integrate the results using the fundamental knowledge.
CO.6– PO10	M	Demonstration of the work can be carried out after the conclusion of the project
CO.6 – PSO3	H	Technology up gradation occurs during the project work

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

■ CHALK & TALK	■ STUD. ASSIGNMENT	■ WEB RESOURCES	
☐LCD/SMART BOARDS	☐STUD. SEMINARS	☐ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

☐ASSIGNMENTS	☐STUD. SEMINARS	☐TESTS/MODEL EXAMS	☐UNIV. EXAMINATION
■ STUD. LAB PRACTICES	■ STUD. VIVA	■ MINI/MAJOR PROJECTS	☐CERTIFICATIONS
☐ADD-ON COURSES	☐OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

☐ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	*■ STUDENT FEEDBACK ON FACULTY (TWICE)*
☐ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	*☐OTHERS*

Dr. Hari C V

Prepared by **Approved by**

(Faculty) **(HOD)**

Project Schedule – S8

Serial Number	Project Plan
1	First Review
2	Second Review
3	Project Rough Report
4	Project Exhibition (Demo Evaluation)
5	Final Project Report
6	Final Presentation with external expert

Evaluation AEI