NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

Course Title	INSTRUMENTATION		
Course Code	PH658	No. of Credits	3
Department	Physics	Faculty	Dr. R.NAGALAKSHMI
Pre-requisites Course Code	-NIL-		
Course Coordinator(s) (if, applicable)	Dr.M.C.Santhoshkumar		
E-mail	santhoshmc@nitt.edu, 0431-2503611		
Course Teacher(s)/Tutor(s) E-mail	nagalakshmi@nitt.edu	Telephone No.	0431 - 2503615
Course Type	Core course		

Syllabus approved in BoS

Unit – I: Generalized Characteristics of Instruments
Static characteristics: accuracy, precision, repeatability, reproducibility, resolution, sensitivity, linearity, drift, span, range. Dynamic characteristics: transfer function , zero order instruments, first order instruments – step, ramp, frequency responses – second order instruments – step-ramp response – dead time elements. Types of Errors: gross, systematic, random.

Unit – II: Vacuum Systems
Principle and operation of various pumps: rotary, diffiusion, sorption, turbomolecular, ionisation and cryopumping. Gauges: McLeod, diaphragm, thermocouple, pirani, penning, ionisation and hot and cold cathodes – design of high vacuum systems – high pressure cells – measurements at high pressures.

Unit – III: Thermal Systems
Temperature scales – liquefaction of gases, achieving low temperature – design of cryostats. High temperature furnaces: resistance, induction and arc furnaces – high temperature measurements – pyrometers – total and selective radiation pyrometers – optical pyrometer.

Unit – IV: Detectors and Spectroscopy
Detectors: pyroelectric, thermoelectric, photoconducting, photoelectric, photomultiplier, scintillation types of detectors, photon counters. Spectroscopy: principles of atomic absorption spectroscopy – instrumentation – single and double beam spectrometers –theory and components of nuclear quadrupole resonance technique – applications.

Unit – V: Signal Conditioning and Error Analysis
Signal conditioning: Impedance matching, filtering, clipping and clamping, attenuators and its types, amplitude modulation and demodulation, lock-in detector, box-car integrator.
Error analysis: Linear and nonlinear curve fitting, chi-square test.

COURSE OVERVIEW

To impart basic knowledge on
1. Generalized characteristics of instruments
2. Production and measurement of vaccum
3.Study of materials at extrememe conditions - high pressure
4. Production of low and high temperatures
5. Detectors for various applications
6.Electronic Instrumentaion and Error analysis

COURSE OBJECTIVES

To acquire knowledge on generalized characteristics of measurement systems and error analysis.

To gain understanding related to production of Vaccum and low temperatures

To know various spectroscopic techniques and detector for analytical studies

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
1. To appreciate the various techniques involved in production of vaccum, low temperatures which will benefit them to handle various instruments in a better way 2. To really understand the static and dynamic characteristics of instruments and analyses of errors will help them in interpreting the data more effectively	To acquire proper knowledge on measurement and control

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week	Topic	Mode of Delivery
1	1-3	Unit I- Generalized characteristics of instruments	Board Teaching along with problem solving
2	4-6	Unit II - Production and measurement of vaccum	Board Teaching with PPT
3	7-9	Unit III - Production of low and high temperatures and measurement	Board Teaching with PPT
4	10-12	Unit IV – Detectors and spectroscopy	Board Teaching with PPT – student Seminar
5	13-15	Unit V – Electronic Instrumentation	Board Teaching with PPT – student Seminar

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle test I	September 3 rd Week	1 hour	20
2	Cycle Test II	November 1st Week	1 hour	20
3	Assigment on problems	November 3rd week	1 week will be given for submission	10
4	Final Assessment	December 1st Week	3 hours	50
5	Compensation Assessment	November 4th Week	1 hour	Appropriate weightage will be calculated

*mandatory; refer to guidelines on page 4

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

Institute Policy will be adopted

COURSE POLICY (including compensation assessment to be specified**)**

MODE OF CORRESPONDENCE (email/ phone etc) : nagalakshmi@nitt.edu,9443940384

COMPENSATION ASSESSMENT POLICY : Retest will be conducted before semester examination on genuine grounds

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- ➢ At least 75% attendance in each course is mandatory.

- ➢ A maximum of 10% shall be allowed under On Duty (OD) category.

- ➢ Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

- ➢ Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.

- ➢ Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.

- ➢ The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

- ➢ The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

The course teacher is available for discussion and clarification during their free times.
Extra classes may also be conducted based on the necessity

FOR APPROVAL

-sd	-sd	-sd
Dr. R. Nagalakshmi	Dr. M.C.Santhoshkumar	Dr. M.Ashok
Course Faculty	CC-Chairperson	HOD

Guidelines:

a) The number of assessments for a course shall range from 4 to 6.

b) **Every course shall have a final assessment on the entire syllabus with at least 30% weightage.**

c) **One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.**

d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	**2017**	**2016**	**2015**	
35% or class average/2 whichever is greater.		Peak/3 or class average/2 whichever is lower		40%

e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.

f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.

g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.