

Department of Chemistry

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE OUTLINE TEMPLATE			
Course Title	Nuclear Chemistry		
Course Code	CH635	No. of Credits	3 (Theory)
Department	Chemistry	Faculty	Dr. V. Rajeshkumar
Programme	M.Sc.(Chemistry)		
Course Coordinator(s) (if, applicable)	Dr. V. Rajeshkumar (Theory)		
E-mail	vrajesh@nitt.edu	Telephone No.	9087070774
Course Type	Elective course		
COURSE OVERVIEW			
<p>This course is offered to II year M.Sc.(Chemistry) students. This 3 credit course is for theory. Three theory classes will be conducted per week.</p>			
COURSE OBJECTIVE			
<p>To introduce the introduction of nuclear chemistry, discovery, types of nuclear reactions and its application M. Sc. students</p>			
COURSE OUTCOMES (CO)			
<p>Students would become familiar with the:</p> <ul style="list-style-type: none"> ✓ Basics of nuclear chemistry ✓ Types of nuclear reactions and its application. 			
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	Week	Topic	Mode of Delivery
1	II week of July	Unit 1: Discovery: Types of decay- decay kinetics: decay constant, half-life period, mean life parent daughter decay-growth relationships	C&T, PPT
2	III week of July	Secular and transient equilibrium- units of radioactivity alpha, beta and gamma decay:	C&T, PPT
3	IV week of July	Theory of decay, energies and properties-artificial radioactivity-	C&T, PPT
4	I week of August	Detectors: Ionization chamber, electron pulse counters, scintillation detectors, semiconductor, detectors, thermo luminescence detectors and neutron detectors	C&T, PPT

5	II week of August	Unit 2: Types of nuclear reactions: Bethe notation, the compound nucleus theory- Reaction cross – section- transmutation reactions, elastic and inelastic scattering,	C&T, PPT
6	III week of August	Spallation, fragmentation, stripping and pick-up, fission, fusion, photonuclear reactions, thermonuclear reactions.	C&T, PPT
7	IV week of August	Unit 3: The fission energy -reproduction factor - classification of reactors- based on moderators, coolant, phase of fuel and generation - principle of thermal nuclear reactors.	C&T, PPT
8	I week of September	The four factor formula - reactor power -critical size of a thermal reactor -excess reactivity and control - breeder reactor - reprocessing of spent fuels -	C&T, PPT
9	II week of September	Nuclear waste management -safety culture - active and passive safety, containment building, nuclear criticality safety, ionizing radiation protection - enforcement agencies.	C&T, PPT
10	III week of September	Unit 4: Radiation chemistry: Passage of radiation through matter -units for measuring radiation absorption -radiation dosimetry	C&T, PPT
11	IV week of September	Radiolysis of water -free radicals in water radiolysis - chemical dosimetry: Radiolysis of Fricke dosimeter solution -radiation-induced colorcenters in crystals	C&T, PPT
12	I week of October	Effects of radiation with matter: Radiolysis of inorganic gases, organic gases, organic compounds, solids, and polymers- Annealing of radiation damage.	C&T, PPT
13	II week of October	Unit 5: Application of radioisotopes: Probing by isotopes, reactions involved in the preparation of radioisotopes	C&T, PPT
14	III week of October	the Szilard-Chalmer's reaction -radiochemical principles in the use of tracers - applications of radioisotopes as tracers-	C&T, PPT
15	IV week of October	Chemical investigations, analytical applications, agricultural and industrial applications	C&T, PPT
16	I week of November	Neutron activation analysis -carbon and rock dating - use of nuclear reactions	C&T, PPT
17	II week of November	Radioisotopes as source of electricity -nuclear medicines.	C&T, PPT

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
	Theory			

1	Assignment/Quiz	I week of Sep	One week	5
2	Test I	II week of Sep	60 minutes	20
3	Assignment/Quiz	III week of Oct	One week	5
4	Test II	IV week of Oct	60 minutes	20
5	Final Assessment	IV week of Nov	3 hours	50

Theory = Total (100)

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

1. W. Loveland, D. Morrissey, G. Seaborg. Modern Nuclear Chemistry, WileyInterscience, Hoboken, NJ, 2006.
2. Arnikar, H. J., Essentials of Nuclear Chemistry, 4thEdn., New Age International Publishers Ltd., New Delhi, 1995.
3. K. H. Lieser, Nuclear and Radiochemistry, 2nd revised ed., Wiley-VCH, Berlin, 2001.
4. G. Choppin, J. O Liljenzin and J. Rydberg. Radiochemistry and Nuclear Chemistry. 3 rd ed. Butterworth-Heinemann, Oxford, 2002.
5. G Friedlander, GW Kennedy, ES Macias and JM Miller. Nuclear and Radiochemistry. 3 rd ed., John Wiley & Sons, New York, 1981.
6. S. Glasstone, Source Book on Atomic Energy, Krieger Pub Co, 3rd Edn, 1979.

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

1. Feedback from students during class committee meetings.
2. Anonymous feedback through questionnaire at the end of the semester.

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

1. 80% attendance is compulsory for appearing final assessment.
2. Plagiarism is strictly not allowed.
3. For those students who missed Test I and Test II due to genuine reasons, retest will be conducted during the III week of November 2017.
4. Extra classes will be conducted, if attendance is shortage for students.

ADDITIONAL COURSE INFORMATION

The faculty will be available for consultation at times as per the intimation by the faculty.

Coordinator *Rajesh Kumar* 07/07/2017 CC-Chairperson *[Signature]* HOD *[Signature]* 7/7/17
DR. A. SOCE (DR. L. CINDRELLA)