SS867 PHOTODYNAMIC THERAPY 4 -0-0 4

AIM

To enable the students to get a thorough knowledge about the principle, mechanism and applications of photodynamictherapy.

COURSE OUTCOMES

Module No	Outcome Statement
1	The student will have a thorough knowledge about the diseases which make use of photodynamic therapy
2	Students will have a thorough understanding of the basic components required for PDT
3	Student will get an exposure to various mechanisms and factors affecting efficiency of photodynamic therapy
4	Student will have an indepth knowledge about the challenges in cancer therapies, advantages of PDT as non –invasive cancer treatment modality and chemical methods to develop various photosensitizers
5	Student will be able to develop skills in PDT for preclinical models of invasive cancer, reviewing the recent research works in the area of PDT

MODE OF TRANSACTION

Lecture cum discussion, demonstration, group presentations, seminars, debates, assignments, brain storming sessions, peer group discussion, interaction with community, case study, survey and dialogue, ICT based teaching and learning

COURSE OUTLINE

Module 1 : Introduction to Photodynamic therapy

Review of historical development of cancer, The difference between benign and malignant tumors, Basic cell chemistry, Cancer growth and metastasis, Causes of cancer with scientific explanations, Classification of anticancer drugs and synthesis of a few significant drugs, Drug toxicity and mechanism of action, Various treatment modalities, Photodynamic therapy: Introduction, basic components, comparison with traditional treatment modalities. History of PDT.

Module 2 : Basic Components of photodynamic therapy

Elements of PDT, Light sources: LASERs, LED, pharmaceutical window, NIR radiations, tissue penetration, fluence rate, light exposure time, total light dose, and light delivery mode.Photosensitizers (PS): Characteristics of ideal PS, classification of PS (a) first generation photosensitizers, (porphyrin and hematoporphyrin), (b) second generation photosensitizers (5’

aminolevulinic acid, chlorin, bacteriochlorin, protoporphyrinIX, methylene blue, phthalocyanine, toluidine blue, and benzopoprhyrin etc.), Photofrin : synthesis and applications. Organic dyes as photosensitizer, Cyanines, Squaraines and croconaines. Role of Oxygen in PDT, production of ROS.

Module 3: Mechanism of PDT

Modified Jablonsky diagram of PDT, type 1 and type 2 process, PDR, Drug dose, Drug light intervals (DLI), subcellular localisation, PET, EET, Biochemical Mechanism, cell survival percentage- calculations, photo induced membrane damage mechanism of PDT, in vivo and in vitro photodynamic action.

Module 4: PDT in cancer therapy

Challenges in cancer therapies, Increased ROS production in PDT, Regulating ROS generation using novel nanoparticles, Boosting singlet oxygen generation using a donor–acceptor system, Development of PSs for targeted PDT:Genetic engineering of PS proteins for targeting and live imaging, Surface-functionalized AIE dots used in PDT, PDT combined with cancer immunotherapies,

Module 5: Research in PDT

Photosensitizers and photocytotoxicity mechanisms, PDT and immune response as a tool to deal with metastasis, Instrumentation, drawbacks and side effects, PDT in preclinical models of invasive cancer, Clinical applications of PDT.

References/Text Books

[1] Raymond Bonnett , Chemical Aspects of Photodynamic Therapy, CRC Press, 2000

[2] Roy Pottier, Barbara Krammer, Herbert Stepp, Reinhold Baumgartner, Photodynamic Therapy with ALA: A Clinical Handbook,Royal Society of Chemistry, 2006

[3] Mahmoud H. Abdel-Kader Photodynamic Therapy: From Theory to Application, Springer , 2014

[4] Michael R. Hamblin, Yingying Huang, Imaging in photodynamic therapy, CRC Press, 2017

[5] Mohamed LotfyTahaElsaie, Photodynamic Therapy: New Research, Nova Science, 2013

[6] Vincenzo Balzani, Electron Transfer in Chemistry: Molecules-level electronics, imaging and information, energy and the environment; Volume 5 of Electron Transfer in Chemistry-, Wiley- VCH, 2001

[7] C. E. Wayne and R. P. Wayne, Photochemistry (OUP Primer)

SCHEME OF EVALUATION

Sl No.	**In- semester assessment**		**End – semester assessment**	
1	Periodical test	30 marks	End Semester Examination	50 mark
2	Assignment	10 marks		
3	Seminar	10 marks		
4	**Sub total**	**50**		**50**
	Grand total		**100**	

ACTIVITIES/ CONTENT WITH DIRECT BEARING ON EMPLOYABILITY/ ENTERPRENEURSHIP/ SKILL DEVELOPMENT (based on NAAC Criteria):

The learner will get a clear understanding of the concepts and ideas regarding the technical and theoretically relevant area which is explored in the course. This course will equip the learner to build a career as a Faculty in Chemistry, Research Scientist in the respective field.