

## Course outline

How does an NPTEL online course work?

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

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## Pericyclic Reactions and Organic Photochemistry

The aim of the course is to make students familiar with the concepts and applications in two important topics in advanced organic chemistry, namely concerted organic reactions and organic photochemistry.

Pericyclic reactions are concerted organic reactions and are governed by Woodward-Hoffmann rules. Different methods of analysis of pericyclic reactions to arrive at the Woodward-Hoffmann rules will be presented. Synthetic applications and mechanisms of various pericyclic reactions will be discussed. Similarly the concepts involved in understanding organic photochemical reactions, their mechanisms and applications in organic synthesis will be presented.

This course will uncover all the major topics in pericyclic reactions and organic photochemistry. In addition to lectures there will be tutorial sessions and assignments in this course.

**INTENDED AUDIENCE** : Core for post-graduates, Post-graduate and upper level undergraduate, Final Year BSc, MSc and PhD

**PREREQUISITES** : Basic course in organic chemistry, stereochemistry and reaction mechanisms

**INDUSTRY SUPPORT** : Pharma and fine chemical industry R&D labs, National labs such as NCL, IICT etc



**Prof. Sankararaman**

IIT Madras

**Prof. S. Sankararaman** has 25 years of teaching and research experience at IIT Madras. He teaches theory courses on organic chemistry, organometallic chemistry, spectroscopy and photochemistry to MSc and PhD students in addition to teaching basic organic and inorganic chemistry courses to B.Tech students. He has written a textbook on Pericyclic Reactions published by Wiley-VCH in 2005. His research interests are in the areas of organic and organometallic chemistry, organic synthesis and catalysis.

## COURSE TYPE

Core

## COURSE LEVEL

Postgraduate

## COURSE LAYOUT

- Week 1:** General introduction to the course, activation of chemical reactions. thermal and photochemical methods, molecular orbitals of conjugated polyenes and their symmetry properties, definition and classification of pericyclic reactions methods of analyzing pericyclic reactions.
- Week 2:** Electrocyclic reactions – introduction, definition and classification, Woodward- Hoffmann rules for electrocyclic reactions, Stereochemical aspects and modes of electrocyclic reactions, analysis of electrocyclic reactions by various methods, examples of electrocyclic reactions.
- Week 3:** Electrocyclic (continued), Cycloaddition reactions, Woodward- Hoffmann rules for cycloaddition reactions, stereochemical aspects and modes of cycloaddition reactions, analysis of cycloaddition reactions by various methods
- Week 4:** Examples of thermal and photochemical [2p+2p] cycloaddition reactions  
Synthesis of cage type compounds using [2p+2p] cycloaddition reactions  
Diels-Alder reaction and its variants and their syntic utility
- Week 5:** 1,3-Dipolar cycloaddition reactions, higher order cycloaddition reactions, sigmatropic rearrangements, Woodward Hoffmann rules for sigmatropic rearrangements
- Week 6:** Sigmatropic rearrangements – examples, Claisen and Cope rearrangements  
[2,3]-sigmatropic rearrangements and higher order rearrangements  
Chelotropic reactions - introduction, definition and classification, Ene reaction.
- Week 7:** Organic photochemistry – introduction, definitions, importance  
Electronic excitation and spin configurations – Jabolanski diagram  
Energy transfer and electron transfer processes – quenching of excited states  
Photochemistry of carbonyl compounds
- Week 8:** Photochemistry of olefins, enones and dienones, photochemistry of aromatic molecules, molecular oxygen and organic photochemistry, supramolecular organic photochemistry.

## BOOKS AND REFERENCES

- S. Sankararaman, Pericyclic Reactions – A textbook. Wiley-VCH, 2005.
- I. Fleming, Pericyclic Reactions, Oxford University Press, 1999.
- N. J. Turro, V. Ramamurthy and J. C. Scalano, Modern molecular photochemistry of organic compounds, University Science Books, 2010.

## CERTIFICATE

- The course is free to enroll and learn from. But if you want a certificate, you have to register and write the proctored exam conducted by us in person at any of the designated exam centres.
- The exam is optional for a fee of Rs 1000/- (Rupees one thousand only).
- Date and Time of Exams: 25th April 2020**, Morning session 9am to 12 noon; Afternoon Session 2pm to 5pm.
- Registration url: Announcements will be made when the registration form is open for registrations.
- The online registration form has to be filled and the certification exam fee needs to be paid. More details will be made available when the exam registration form is published. If there are any changes, it will be mentioned then.
- Please check the form for more details on the cities where the exams will be held, the conditions you agree to when you fill the form etc.

### CRITERIA TO GET A CERTIFICATE:

- Average assignment score = 25% of average of best 6 assignments out of the total 8 assignments given in the course.
- Exam score = 75% of the proctored certification exam score out of 100
- Final score = Average assignment score + Exam score

### YOU WILL BE ELIGIBLE FOR A CERTIFICATE ONLY IF AVERAGE ASSIGNMENT SCORE $\geq 10/25$ AND EXAM SCORE $\geq 30/75$ .

- If one of the 2 criteria is not met, you will not get the certificate even if the Final score  $\geq 40/100$ .
- Certificate will have your name, photograph and the score in the final exam with the breakup. It will have the logos of NPTEL and IIT Madras. It will be e-verifiable at [nptel.ac.in/noc](http://nptel.ac.in/noc).
- Only the e-certificate will be made available. Hard copies will not be dispatched.