

TEMPLATE FOR REVISED COURSE CONTENT

New Course Code and Title	MS7027 - ADVANCED METHODS IN POLYMER CHARACTERIZATION
Details of Course	<p>Summary of course content (please note that this information provided will also be uploaded to the web for viewing at large)</p> <p><i>Without the knowledge of chemical composition, molecular structure, supramolecular organization, morphology, size and shape, physical and chemical properties of polymers, as well as their thermal, environmental, and chemical stability, thermodynamic behavior, melt rheology and processing, and the many other physical and chemical parameters, no modern polymer materials science, plastics technology & engineering and related polymer industry would exist. Hence polymer analysis and characterization has been an enabling field for modern organic materials. It is thus not surprising, that there are numerous text and reference books available devoted to this subject. Yet in view of the swift development of physical techniques, ICT tools, automation, nanotechnology instruments, and with the growth of the complexity of materials systems, and miniaturization/high throughput experimentation a substantial paradigm shift has taken place in this field.</i></p> <p><i>Thus, a course emphasizing the current advances, while building on the established approaches has its place in an advanced graduate program.</i></p> <p>Rationale for introducing this course</p> <p>With the advent of nanotechnology, tools have been developed and become broadly accessible that allow one to interrogate matter from a true molecular perspective. Molecular imaging, single bond forces, single molecule optical and infrared spectroscopy, chemical identification of molecules, nanoscale studies of physical/chemical properties at the single species level, and nanoscale manipulation of materials are now within reach for all scientists. Macromolecular nanoscience and nanotechnology are fundamentally changing our way of looking at soft matter, characterizing it, and producing/processing it. Single molecule analyses duly indicate the enhanced accuracy, precision and sensitivity of analytical instrumentation.</p> <p>Parallel with the development of nanoscale tools, instrument miniaturization and shortening experimental turnaround times have also experienced tremendous growth. High throughput synthesis and combinatorial methods (originally developed for the pharmaceutical industries) necessitated attention and progress in specific analytical approaches to tackle the enormous materials libraries and find optimum structures for given applications. This area has been considered as one with enormous promise, but not without challenges.</p>

	<p>Aims and objectives</p> <p>This graduate course shall provide in an easy-to-follow way the physical and chemical foundations for the various characteristics, the basic working principles of the analytical approaches, the pitfalls and limitations, and try to use examples taken from the latest scientific literature illustrating the state-of-the-art.</p> <p>The course shall not have the ambition to derive all relationships and offer an axiomatic and encyclopedic treatment, but be practical and relevant, focusing on the key questions of polymer analysis and characterization and the most recent developments.</p>																		
	<p>Syllabus</p> <ol style="list-style-type: none"> 1. Molecular characterization 2. Thermal characterization and transitions 3. Surface and interfaces 4. Supramolecular and microstructural characterization 5. Characterization of chain dynamics and melt viscoelasticity <p>Mechanical characterization in the solid state</p>																		
<p>Assessment</p> <p>Please specify if components are individually assessed or group assessed</p>	<table border="0"> <tr> <td><i>First assignment</i></td> <td><i>Individual</i></td> <td><i>10%</i></td> </tr> <tr> <td><i>Quizzes</i></td> <td><i>Individual</i></td> <td><i>15%</i></td> </tr> <tr> <td><i>Mid-term</i></td> <td><i>Individual</i></td> <td><i>15%</i></td> </tr> <tr> <td><i>Symposium</i></td> <td><i>Individual</i></td> <td><i>10%</i></td> </tr> <tr> <td><i>Final examination</i></td> <td><i>Individual</i></td> <td><i>50%</i></td> </tr> <tr> <td><i>First assignment</i></td> <td></td> <td></td> </tr> </table>	<i>First assignment</i>	<i>Individual</i>	<i>10%</i>	<i>Quizzes</i>	<i>Individual</i>	<i>15%</i>	<i>Mid-term</i>	<i>Individual</i>	<i>15%</i>	<i>Symposium</i>	<i>Individual</i>	<i>10%</i>	<i>Final examination</i>	<i>Individual</i>	<i>50%</i>	<i>First assignment</i>		
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	<p>Total: 100%</p>																		
<p>Hours of Contact/Academic Units</p>	<p>39 hours / 3 AU</p>																		
<p>Proposed Date of Offer</p>	<p>Semester 1 (AY 2021/2022)</p>																		
<p>Instructor and Co-instructor (if any)</p>	<p>Professor Julius Vancso & Professor Harm-Anton Klok</p>																		
<p>Class size</p>	<p>25</p>																		
<p>Any duplication of course School is advised to coordinate/check with the School offering the course to avoid duplication.</p>	<p>-Nil-</p>																		