

Manufactured Fibre Technology - Web course

COURSE OUTLINE

(a) Polymerization of important fibre forming polymers

Polymerization of nylon-6, nylon-66, poly(ethylene terephthalate), and polyacrylonitrile. Important reactions and their kinetic rate equations. Batch versus continuous reactors. Modification of PET and nylons.

(b) Fundamentals of spinning

Introduction to spinning, thermodynamics of spinning, polymer rheology, shear flow through a capillary, elongational flow in a spinning line, melt instabilities, momentum and heat transport in spinning.

(c) Melt Spinning

Melt spinning lines. Slow speed spinning, stress induced crystallization in high speed melt spinning.

Characteristic features of PET, polyamide and polypropylene melt-spinning. Spin finish and its components.

(d) Solution spinning

Wet and dry solution spinning processes. Fundamentals of solution spinning-transport phenomena, kinetics and thermodynamics, Effect of parameters on fibre structure.

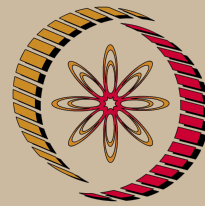
Importance of dry jet wet spinning of PAN.

(e) Post-spinning operations

Introduction to drawing and heat-setting in thermoplastic fibres. Effect of various parameters on structure and properties of fibres.

COURSE DETAIL

S.No	Modules	No. of Lectures
1	Polymerization of important fibre forming polymers would include important reactions and their kinetic rate equations. Batch versus continuous reactors for polymerization of	
	• Nylon-6	3
	• Nylon-66	1
	• Poly(ethylene terephthalate)	3



NP-TEL

NPTEL

<http://nptel.iitm.ac.in>

Textile Engineering

Pre-requisites:

Textile Fibres and basic knowledge of Polymer Chemistry.

Additional Reading:

1. Synthetic fibres: nylon, polyester, acrylic, polyolefin (Woodhead Publishing Limited) (Hardcover) by J E MacIntyre CRC Press, 2004.
2. High-Speed Fiber Spinning: Science and Engineering Aspects by Andrzej Ziabicki (Editor), Hiromichi Kawai (Editor) Krieger Publishing Company (August 1991).
3. Advanced Fiber Spinning Technology by Toshi Takajima (Author), J. E. McIntyre (Editor), K. Kajiwara (Editor), 1994 Woodhead Publications.
4. Fundamentals of Fibre Formation: The Science of Fibre Spinning and Drawing by Andrzej Ziabicki, John Wiley & Sons 1976.

Coordinators:

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	<ul style="list-style-type: none"> • Polyacrylonitrile 	3
	<ul style="list-style-type: none"> • Modification of PET and nylons 	2
2	Fundamentals of spinning	
	<ul style="list-style-type: none"> • Introduction to spinning and thermodynamics of spinning 	1
	<ul style="list-style-type: none"> • Polymer rheology including shear flow through a capillary and elongational flow in a Spinning line 	3
	<ul style="list-style-type: none"> • Melt instabilities 	2
	<ul style="list-style-type: none"> • Momentum and heat transport in spinning 	2
3	Melt Spinning	
	<ul style="list-style-type: none"> • Melt spinning lines 	1
	<ul style="list-style-type: none"> • Slow speed spinning 	2
	<ul style="list-style-type: none"> • Stress induced crystallization in high speed melt spinning 	2
	<ul style="list-style-type: none"> • Characteristic features of PET, polyamide and polypropylene melt- spinning 	3
	<ul style="list-style-type: none"> • Spin finish and its components 	1
4	Solution spinning	
	<ul style="list-style-type: none"> • Wet and dry solution spinning processes 	1
	<ul style="list-style-type: none"> • Fundamentals of solution spinning- transport phenomena, kinetics and thermodynamics including the effect of parameters on fibre structure 	3
	<ul style="list-style-type: none"> • Importance of dry jet wet spinning of PAN 	2
5	Post-spinning operations	
	<ul style="list-style-type: none"> • Introduction to drawing 	1

• Effect of various parameters	2
• Stability of drawing process	1
• Introduction to heat setting in thermoplastic fibres	1
• Effect of various parameters on structure and properties of fibres	2

References:

1. Manufactured Fibre Technology, Editors: V. B. Gupta and V. K. Kothari; Springer; 1997.
2. Polyesters and polyamides (Woodhead Publishing in Textiles) (Hardcover) by BL Deopura (Editor), R. Alagirusamy (Editor), M. Joshi (Editor), B. Gupta (Editor); CRC, 2008.