

**INDUSTRIAL ENGINEERING AND OPERATIONS RESEARCH PROGRAM<sup>1</sup>:  
FIRST AND SECOND YEARS**

	SEMESTER I	SEMESTER II	SEMESTER III	SEMESTER IV
<b>MATHEMATICS</b>	MATH UN1101 (3)	MATH UN1102 (3)	APMA E2000 (4) and E2001 (0)	→ Linear algebra (3) <sup>2</sup>
<b>PHYSICS (three sequences, choose one)</b>	UN1401 (3) UN1601 (3.5) UN2801 (4.5)	UN1402 (3) UN1602 (3.5) UN2802 (4.5)	Chemistry or physics lab: PHYS UN1494 (3) or PHYS UN3081 (2) or CHEM UN1500 (3) or CHEM UN1507 (3) or CHEM UN3085 (4)	
<b>CHEMISTRY (choose one course)</b>	UN1403 (3) or UN1404 (3) or UN1604 (3.5) or UN2045 (3.5)			
<b>UNIVERSITY WRITING</b>	CC1010 (3) either semester			
<b>REQUIRED NONTECHNICAL ELECTIVES</b>	ECON UN1105 (4) and UN1155 recitation (0) either semester		HUMA CC1001, COCI CC1101, or Global core (3–4)	HUMA CC1002, COCI CC1102, or Global core (3–4)
			HUMA UN1121 or UN1123 (3) either semester	
<b>FIRST- AND SECOND- YEAR DEPT. REQUIREMENTS</b>			IEOR E3658 (3) either semester	
<b>COMPUTER SCIENCE</b>	ENGI E1006 (3) in either semester <sup>3</sup>			IEOR E2000 (3) <sup>4</sup>
<b>PHYSICAL EDUCATION</b>	UN1001 (1)	UN1002 (1)		
<b>THE ART OF ENGINEERING</b>	ENGI E1102 (4) either semester			

<sup>1</sup> This includes all undergraduate programs within the Department of Industrial Engineering and Operations Research.

<sup>2</sup> The linear algebra requirement may be filled by either MATH UN2010 or APMA E3101 or COMS W3251.

<sup>3</sup> ENGI E1006 can be replaced by COMS W1004 or COMS W1007.

<sup>4</sup> IEOE E2000 can be replaced by COMS W3134 and COMS W4111. Students cannot get credit for IEOE E2000 if IEOE E2000 is taken after COMS W3134 and COMS W4111.

INDUSTRIAL ENGINEERING: THIRD AND FOURTH YEARS				
	SEMESTER V	SEMESTER VI	SEMESTER VII	SEMESTER VIII
<b>REQUIRED COURSES<sup>1</sup></b>	IEOR E3106 (3) Stochastic systems and applications  IEOR E3608 (3) Foundations of optimization  IEOR E4307 (3) Statistics and data analysis	IEOR E3402 (4) Production & inventory planning  IEOR E3404 (4) Simulation  IEOR E3609 (3) Advanced optimization	IEOR E4200 (3) Human-centered design and innovation	IEOR E4405 (3) Scheduling
<b>ELECTIVES</b>	<b>NONTECH</b>	Students must complete the 27-point requirement. Please refer to page 9.		
	<b>TECH<sup>2</sup></b>	15 points		
	<b>MANAGEMENT<sup>3</sup></b>	3 points		
<b>TOTAL ESTIMATED POINTS<sup>4</sup></b>	15	14	15	12

<sup>1</sup> Taking required courses later than the prescribed semester is not permitted.

<sup>2</sup> 15 points total. At least 6 points need to be at least 3000 level with the prefix IEO, ORCS, or CSOR. The complete list is available at [ieor.columbia.edu/undergraduate/electives](http://ieor.columbia.edu/undergraduate/electives).

<sup>3</sup> 3 points total. Cannot double-count non-technical electives. The complete list is available at [ieor.columbia.edu/undergraduate/electives](http://ieor.columbia.edu/undergraduate/electives).

<sup>4</sup> Students must complete a minimum of 128 points to graduate.

OPERATIONS RESEARCH: THIRD AND FOURTH YEARS				
	SEMESTER V	SEMESTER VI	SEMESTER VII	SEMESTER VIII
<b>REQUIRED COURSES<sup>1</sup></b>	IEOR E3106 (3) Stochastic systems and applications  IEOR E3608 (3) Foundation of optimization  IEOR E4307 (3) Statistics and data analysis	IEOR E3402 (4) Production & inventory planning  IEOR E3404 (4) Simulation  IEOR E3609 (3) Advanced optimization	IEOR E4407 (3) Game theoretic models of operations.	IEOR E4405 (3) Scheduling
<b>ELECTIVES</b>	<b>NONTECH</b>	Students must complete the 27-point requirement. Please refer to page 9.		
	<b>TECH<sup>2</sup></b>	15 points		
	<b>MANAGEMENT<sup>3</sup></b>	3 points		
<b>TOTAL ESTIMATED POINTS<sup>4</sup></b>	15	14	15	12

<sup>1</sup> Taking required courses later than the prescribed semester is not permitted.

<sup>2</sup> 15 points total. At least 6 points need to be at least 3000 level with the prefix IEO, ORCS, or CSOR. The complete list is available at [ieor.columbia.edu/undergraduate/electives](http://ieor.columbia.edu/undergraduate/electives).

<sup>3</sup> 3 points total. Cannot double-count non-technical electives. The complete list is available at [ieor.columbia.edu/undergraduate/electives](http://ieor.columbia.edu/undergraduate/electives).

<sup>4</sup> Students must complete a minimum of 128 points to graduate.

## OPERATIONS RESEARCH: ANALYTICS: THIRD AND FOURTH YEARS

OPERATIONS RESEARCH: ANALYTICS: THIRD AND FOURTH YEARS				
	SEMESTER V	SEMESTER VI	SEMESTER VII	SEMESTER VIII
<b>REQUIRED COURSES<sup>1</sup></b>	IEOE E3106 (3) Stochastic systems and applications  IEOE E3608 (3) Foundation of optimization  IEOE E4307 (3) Statistics and data analysis	IEOE E3404 (4) Simulation  IEOE E3609 (3) Advanced optimization  IEOE E4650 (3) Business analytics  ORCS E4201 (4) Policy for privacy technologies		
<b>ELECTIVES</b>	<b>NONTECH</b>	Students must complete the 27-point requirement. Please refer to page 9.		
	<b>TECH<sup>2</sup></b>	15 points		
	<b>MANAGEMENT<sup>3</sup></b>	3 points		
<b>TOTAL ESTIMATED POINTS<sup>4</sup></b>	15	13	15	12

<sup>1</sup> Taking required courses later than the prescribed semester is not permitted.

<sup>2</sup> 15 points total. At least 6 points need to be at least 3000 level with the prefix IEOE, ORCS, or CSOR. The complete list is available at [ieor.columbia.edu/undergraduate/electives](http://ieor.columbia.edu/undergraduate/electives).

<sup>3</sup> 3 points total. Cannot double-count non-technical electives. The complete list is available at [ieor.columbia.edu/undergraduate/electives](http://ieor.columbia.edu/undergraduate/electives).

<sup>4</sup> Students must complete a minimum of 128 points to graduate.

## OPERATIONS RESEARCH: ENGINEERING MANAGEMENT SYSTEMS: THIRD AND FOURTH YEARS

OPERATIONS RESEARCH: ENGINEERING MANAGEMENT SYSTEMS: THIRD AND FOURTH YEARS				
	SEMESTER V	SEMESTER VI	SEMESTER VII	SEMESTER VIII
<b>REQUIRED COURSES<sup>1</sup></b>	IEOE E3106 (3) Stochastic systems and applications  IEOE E3608 (3) Foundations of optimization  IEOE E4307 (3) Statistics and data analysis	IEOE E3402 (4) Production & inventory planning  IEOE E3404 (4) Simulation  IEOE E3609 (3) Advanced optimization	IEOE E4003 (3) Corporate finance for eng.	IEOE E4998 (4) Managing technological innovations
<b>ELECTIVES</b>	<b>NONTECH</b>	Students must complete the 27-point requirement. Please refer to page 9.		
	<b>TECH<sup>2</sup></b>	12 points		
	<b>MANAGEMENT<sup>3</sup></b>	6 points		
<b>TOTAL ESTIMATED POINTS<sup>4</sup></b>	15	14	15	12

<sup>1</sup> Taking required courses later than the prescribed semester is not permitted.

<sup>2</sup> 15 points total. At least 6 points need to be at least 3000 level with the prefix IEOE, ORCS, or CSOR. The complete list is available at [ieor.columbia.edu/undergraduate/electives](http://ieor.columbia.edu/undergraduate/electives).

<sup>3</sup> 3 points total. Cannot double-count non-technical electives. The complete list is available at [ieor.columbia.edu/undergraduate/electives](http://ieor.columbia.edu/undergraduate/electives).

<sup>4</sup> Students must complete a minimum of 128 points to graduate.

**OPERATIONS RESEARCH: FINANCIAL ENGINEERING:  
THIRD AND FOURTH YEARS**

	SEMESTER V	SEMESTER VI	SEMESTER VII	SEMESTER VIII
<b>REQUIRED COURSES<sup>1</sup></b>	IEOE E3008 (3)  IEOE E3106 (3) Stochastic systems and applications  IEOE E3608 (3) Foundations of optimization  IEOE E4003 (3) Corporate finance for eng  IEOE E4307 (3) Statistics and data analysis	IEOE E3404 (4) Simulation  IEOE E3609 (3) Advanced optimization  IEOE E4700 (3) Intro. to FE	IEOE E4500 (3) Applications prog. for FE	
<b>ELECTIVES</b>	<b>NONTECH</b>	Students must complete the 27-point requirement. Please refer to page 9.		
	<b>TECH<sup>2</sup></b>	15 points		
	<b>MANAGEMENT<sup>2</sup></b>	3 points		
<b>TOTAL ESTIMATED POINTS<sup>4</sup></b>	15	13	15	12

<sup>1</sup> Taking required courses later than the prescribed semester is not permitted.

<sup>2</sup> 15 points total. At least 6 points need to be at least 3000 level with the prefix IEOE, ORCS, or CSOR. The complete list is available at [ieor.columbia.edu/undergraduate/electives](http://ieor.columbia.edu/undergraduate/electives).

<sup>3</sup> 3 points total. Cannot double-count non-technical electives. The complete list is available at [ieor.columbia.edu/undergraduate/electives](http://ieor.columbia.edu/undergraduate/electives).

<sup>4</sup> Students must complete a minimum of 128 points to graduate.