

**CHEMICAL ENGINEERING PhD Program (on MSc)**

<b>REMEDIAL COURSES</b>				
<b>Dept.</b>	<b>Code</b>	<b>Course Name</b>	<b>CR.</b>	<b>ECTS</b>
CHBE	215	Material and Energy Balances	NC	
CHBE	232	CHBE I : Fluid Mechanics	NC	
CHBE	331	CHBE II : Heat Transfer	NC	
CHBE	333	CHBE III : Mass Transfer	NC	
CHBE	362	Reactor Design	NC	
MATH	241	Differential Equations	NC	
<b>PROGRAM COURSES</b>				
<b>Dept.</b>	<b>Code</b>	<b>Course Name</b>	<b>CR.</b>	<b>ECTS</b>
CHBE	512	Modeling and Analysis of Chemical Engineering Systems	3	10
CHBE	514	Advanced Engineering Thermodynamics	3	10
CHBE	534	Transport Phenomena	3	10
CHBE	562	Advanced Chemical and Biological Reaction Engineering	3	10
		Departmental Elective I	3	10
		Departmental Elective II	3	10
		Free Elective I*	3	7
CHBE	690	PhD Seminar	NC	2
CHBE	691	Independent Study for Qualifying Exam	NC	30
CHBE	700	PhD Dissertation	NC	150
		<b>TOTAL</b>	<b>21</b>	<b>249</b>
<b>EXTRA/NON-DEGREE COURSES</b>				
<b>Dept.</b>	<b>Code</b>	<b>Course Name</b>	<b>CR.</b>	<b>ECTS</b>
		Extra/Non-degree	NC	

\* If a student did not take a research methods/methodologies course during MS work, he/she shall take one of the courses in Research Methodologies instead of Free Elective I.

<b>Course Group</b>	<b>Description</b>
Departmental Elective I-II	Chemical Engineering courses under the GSNAS
Free Elective I	Unrestricted, by approval of advisor and CHEM department.
Research Methodologies	ESYE 501.MSN 501
Extra/Non-degree	Optional non-credit (NC) courses that are not part of the program
Remedial Courses	Undergraduate level courses offered by department.