



20. Course Specification of Manufacturing Processes-I

I. Course Identification and General Information:					
1.	Course Title:	Manufacturing Processes I.			
2.	Course Code & Number:	ME112.			
3.	Credit Hours:	C.H			TOTAL Cr. Hrs.
		Th.	Seminar/Tu.	Pr	
		2	-	2	-
4.	Study Level/ Semester at which this Course is offered:	Second Year – First Semester.			
5.	Pre –Requisite (if any):	Engineering Workshop.			
6.	Co –Requisite (if any):	None.			
7.	Program (s) in which the Course is offered:	Mechanical Engineering Program.			
8.	Language of Teaching the Course:	English Language.			
9.	Location of Teaching the Course:	Mechanical Engineering Department.			
10.	Prepared By:	Assoc. Prof. Dr. Amin Alkhulaidi.			
11.	Date of Approval:				

II. Course Description:

This course covers fundamentals of manufacturing processes including interrelationships between the properties of the material and the manufacturing process under the classification of processing operations and the basic parameters involved in these processes. This course will focus on basic manufacturing processes of metal forming, forging, rolling, extrusion, wire drawing, tube drawing and making. The course will cover other topics in manufacturing process such as press-work and die-punch assembly and casting. This course will also cover standard inspection and measurement techniques and how they are used in manufacturing process. Practical experience from selected manufacturing sample parts is expected in this course.

III. Alignments of the Course Intended learning outcomes (CILOs)		Referenced PILOs
a1	Describe the different manufacturing processes, concept, capabilities process parameters, process optimization, and the advantages and limitations of various processes.	A1

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a2	Explain the behavior and properties of materials as they are altered and influenced by processing in manufacturing.	A2
b1	Propose suitable manufacturing process to produce a part from different available alternatives and required quality inspection.	B1
b2	Propose suitable materials according to the application and manufacturing process.	B2
c1	Perform sample parts by selected manufacturing process	C1
c2	Apply the safety protection required for the manufacturing process covered in the course	C3
d1	Assess the manufacturing processes in written technical report and oral seminar.	D1
d2	Cooperate efficiently within a practical discussion and working as teams.	

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1- Describe the different manufacturing processes, concept, capabilities process parameters, process optimization, and the advantages and limitations of various processes.	Lectures. Workshop Activities.	Homework. Major Exams.
a2- Explain the behavior and properties of materials as they are altered and influenced by processing in manufacturing.		

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1- Propose suitable manufacturing process to produce a part from different available alternatives and required quality inspection.	Lectures. Groups Practical. Manufacturing Process Training.	Homework. Theoretical Exam. Practical Exams.

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b2- Propose suitable materials according to the application and manufacturing process.		Producing a Part by Selection Manufacturing Process.
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© Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1- Perform sample parts by selected manufacturing process.	Lectures. Groups Product Design.	Product Design Report Assessment.
c2- Apply the safety protection required for the manufacturing process covered in the course	Groups Practical Manufacturing Process Training.	Manufacturing Parts Assessment. Theoretical Exams.

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1- Assess the manufacturing processes in written technical report and oral seminar.	Project Report for Design and Manufacturing a Part.	Assignment Reports. Discussion Groups.
d2- Cooperate efficiently within a practical discussion and working as teams.		

IV. Course Content:

A – Theoretical Aspect:					
Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact Hours
1.	Introduction to Manufacturing.	a1,b1	<ul style="list-style-type: none"> Manufacturing a Product: General Considerations Choosing Methods of Manufacturing Classification of Manufacturing Processes 	1	2

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			<ul style="list-style-type: none"> • Introduction to Deformation Process, Polymer, Plastic and Sheet Metal. 		
2.	Materials and Manufacturing.	a2,b2	<ul style="list-style-type: none"> • Introduction to Material Properties. • Important Engineering Characteristics of Materials. • Material-Process-Geometry Relationships. • Functional Parameters of Mechanical and Thermal Properties affected by Production Processes. • Factors affecting Material Properties during Machining. 	1	2
3.	Measurement and Inspection.	a1,b1	<ul style="list-style-type: none"> • Linear Measurement Metric System (Millimeters), Gages, Graduated Measuring Devices. • Shape, Dimensions, Shape and Location Deviations. • Measurement Instruments Inspection Tools and Techniques. • Machined Parts Surface Roughness Measurements, Stylus, Optical Devices SEM. • Introduction to Nondestructive Testing Methods. • Common Application/uses of NDT. 	1	2

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			<ul style="list-style-type: none"> Automated Inspection. 		
4.	Basic Metal Forming Process and Use.	a1,a2,b1,b2,c1,c2,d1,d2	<ul style="list-style-type: none"> Advantages of Mechanical Working Processes. Difference Between Hot and Cold Working. Advantages and Disadvantages of Cold and Hot Working Processes. Classification of Metal Forming Processes According to Type of Stress Employed. 	2	4
5.	Forging Process.	a1,a2,b1,b2,c1,c2	<ul style="list-style-type: none"> Classification of Forging. Die Forging with Power Hammers (Open, Impression, Closed Die Forging). Machine Forging. Forging Defects. 	1	2
6.	Rolling Process.	a1,a2,b1,b2,c1,c2,d1,d2	<ul style="list-style-type: none"> Nomenclature of Rolled Products. Mechanism of Rolling. Types of Rolling Mills. Rolls and Roll Pass Design. Ring Rolling. Cold Rolling Rolling Defects. 	1	2
7.	Mid-Term Exam.	a1,a2,b1,b2,c1,c2.	<ul style="list-style-type: none"> The First 6 Chapters. 	1	2
8.	Rolling Process.	a1,a2,b1,b2,c1,c2,d1,d2	<ul style="list-style-type: none"> Nomenclature of Rolled Products. Mechanism of Rolling. Types of Rolling Mills. Rolls and Roll Pass Design. Ring Rolling. 	1	2

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			<ul style="list-style-type: none"> • Cold Rolling • Rolling Defects. 		
9.	Extrusion, Wire Drawing, Tube Drawing and Making.	a1,a2,b1,b2,c 1,c2,d1,d2	<ul style="list-style-type: none"> • Extrusion Processes. • Machines for Extrusion. • Extrusion Defects. • Wire Drawing. • Tube Drawing. • - Tube Making. 	1	2
10.	Press Work and Die-Punch Assembly	a1,a2,b1,b2,c 1,c2	<ul style="list-style-type: none"> • Tools • Other Operations Performed with (Presses, Bending, Deep Drawing, Coining and Embossing Coining). 	1	2
11.	Casting Process.	a1,a2,b1,b2,c 1,c2	<ul style="list-style-type: none"> • Types of Patterns. • Moulding Sand and its Properties. • Mould Making Technique (Core, Core Print, Gates, Runners and Risers). • Casting Defects. • Die Casting. 	2	4
12.	Welding Process.	a1,a2,b1,b2,c 1,c2	<ul style="list-style-type: none"> • Gas Welding Process. • Welding Operation • Arc Welding and Defects. • Electric Resistance Welding (Spot, Seam etc). • Soldering and Brazing. 	1	2
13.	Review.	a1,a2,b1,b2,c 1,c2	All the Chapters.	1	2
14.	Final Exam.		All the Chapters.	1	2
Number of Weeks /and Units Per Semester				16	32

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes
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1.	Lab Session devoted to Safety Issues in the Manufacturing Process.	1	2	a1,b1,c2
2.	Material Test Lab.	1	2	a2,b2
3.	Measurements Tools – Workshop.	1	2	a1,b1
4.	Metal Forming Lab. (producing a Part)	2	4	a1,a2,b1,b2,c1,c2,d1,d2
5.	Forging Lab.	1	2	a1,a2,b1,b2,c1,c2
6.	Rolling Lab. (producing a Part).	2	4	a1,a2,b1,b2,c1,c2,d1,d2
7.	Extrusion Lab.	1	2	a1,a2,b1,b2,c1,c2
8.	Press Lab.	1	2	a1,a2,b1,b2,c1,c2
9.	Casting Lab.	2	4	a1,a2,b1,b2,c1,c2
10.	Welding Lab.	2	4	a1,a2,b1,b2,c1,c2
Number of Weeks /and Units Per Semester		14	28	

V. Teaching strategies of the course:

- Lectures, Class Activity and Class Attendance.
- Lab. and Workshop Practical Activities (Single/Groups Practical Activities).
- Reports for Practical Workshop Training & Lab. Case Study.

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Design parts showing the manufacturing sequence using selected manufacturing process	a1,a2, b1,b2, c1,c2,d1,d2	6	7.5
2.	Manufacturing the designed parts	a1,a2, b1,b2, c1,c2,d1,d2	11	7.5
Total				15

VII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
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1.	Practical projects assessments designing and manufacturing parts using selected manufacturing process.	10	15	10%	a1,a2, b1,b2, c1, c2 ,d1,d2
2.	Mid-Term Exam.	8	45	30%	a1,a2, b1,b2, c1,c2
3.	Final Exam.	16	90	60%	a1,a2, b1,b2, c1,c2
	Total:		150	100 %	

VIII. Learning Resources:	
<ul style="list-style-type: none"> Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher). 	
1- Required Textbook(s) (maximum two).	
	1. John A. Schey (2000), Introduction to Manufacturing Processes, 3 rd , Edition, McGraw Hill. 2. G. Boothroyd and W.A. Knight (2006), Fundamentals of Machining and Machine Tools, 3 rd edition, CRC Taylor and Francis.
2- Essential References.	
	1. Serope Kalpakjian and Steven R. Schmid, (2001) “Manufacturing Engineering and Technology”, 4th Edition, Prentice-Hall, Inc., 2. DeGarmo, (1997) “Materials and Processes in Manufacturing”, 2 nd Edition, Prentice Hall., 3. George Tlusty, (2000) Manufacturing Processes and Equipment, Prentice-Hall, Inc.,.
3- Electronic Materials and Web Sites etc.	
	Internet engine Search – Manufacturing Process Topics. Video Cassettes / CDS. Learning Materials Transparencies

IX. Course Policies:	
	Class Attendance:
1.	-A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic
2.	Tardy:

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	- For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.
3.	Exam Attendance/Punctuality: - A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.
4.	Assignments & Projects: - The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5.	Cheating: - For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6.	Plagiarism: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proved a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7.	Other policies: - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. Lecture notes and assignments my given directly to students using soft or hard copy

Reviewed By	<u>Vice Dean for Academic Affairs and Post Graduate Studies: Asst. Prof. Dr. Tarek A. Barakat</u> <u>President of Quality Assurance Unit: Assoc. Prof. Dr. Mohammed Algorafi</u> <u>Name of Reviewer from the Department: Assoc. Prof. Dr. Abdul-Malik Momin</u>
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20. Template for Course Plan of Manufacturing Processes -

I

I. - Information about Faculty Member Responsible for the Course:							
Name of Faculty Member	Assoc. Prof. Dr. Amin Alkhulaidi	Office Hours					
Location & Telephone No.		SAT	SUN	MON	TUE	WED	THU
E-mail							

II. Course Identification and General Information:						
1.	Course Title:	Manufacturing Processes – I.				
2.	Course Code & Number:	ME112.				
3.	Credit Hours:	C.H				TOTAL CR. HRS.
		Th.	Seminar/ Tu.	Pr	Tr.	
		2	-	2	-	
4.	Study Level/ Semester at which this Course is offered:	Second Year – First Semester.				
5.	Pre –Requisite (if any):	Engineering Workshop.				
6.	Co –Requisite (if any):	None.				
7.	Program (s) in which the Course is offered:	Mechanical Engineering Program.				
8.	Language of Teaching the Course:	English Language.				
9.	System of Study:	Semesters.				
10.	Mode of Delivery:	Lectures and Workshop.				
11.	Location of Teaching the Course:	Mechanical Engineering Department.				

III. Course Description:
<p>This course covers fundamentals of manufacturing processes including interrelationships between the properties of the material and the manufacturing process under the classification of processing operations and the basic parameters involved in these processes. This course will focus on basic manufacturing processes of metal forming, forging, rolling, extrusion, wire drawing, tube drawing and making. The course will cover other topics in manufacturing process such as press-work and</p>

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die-punch assembly and casting. This course will also cover standard inspection and measurement techniques and how they are used in manufacturing process. Practical experience from selected manufacturing sample parts is expected in this course.

IV. Intended learning outcomes (ILOs) of the course:

Brief summary of the knowledge or skill the course is intended to develop:

1. Explain the behavior and properties of materials as they are altered and influenced by processing in manufacturing.
2. Understand standard inspection and measurement techniques and how they are used in manufacturing process.
3. Understand the basics manufacturing processes of metal forming, forging, and rolling process.
4. Learn the basic operation of various manufacturing processes such as extrusion, wire drawing, tube drawing and making.
5. Understand other manufacturing process such as press work and die-punch assembly, casting and casting
6. Demonstrate hands-on experience gain from the selected manufacturing process with the intent of providing a working knowledge of a broad range of manufacturing processes.
7. Demonstrate the ability to work both as an individual and as a team member to gain practical experience by manufacturing sample parts.
8. Develop an appreciation for the skills, expertise, and responsibilities of skilled workers and their impact on safe manufacturing environment.

V. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
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1.	Introduction to Manufacturing	<ul style="list-style-type: none"> • Manufacturing a Product: General Considerations • Choosing Methods of Manufacturing • Classification of Manufacturing Processes • Introduction to Deformation Process, Polymer, Plastic and Sheet Metal. 	1 st	2
2.	Materials and Manufacturing	<ul style="list-style-type: none"> • Introduction to Material Properties. • Important Engineering Characteristics of Materials. • Material-Process-Geometry Relationships. • Functional Parameters of Mechanical and Thermal Properties affected by Production Processes. • Factors affecting Material Properties during Machining. 	2 nd	2
3.	Measurement and Inspection.	<ul style="list-style-type: none"> • Linear Measurement Metric System (Millimeters), Gages, Graduated Measuring Devices. • Shape, Dimensions, Shape and Location Deviations. • Measurement Instruments Inspection Tools and Techniques. • Machined Parts Surface Roughness Measurements, Stylus, Optical Devices SEM. • Introduction to Nondestructive Testing Methods. • Common Application/uses of NDT. • Automated Inspection. 	3 rd	2
4.	Basic Metal Forming	<ul style="list-style-type: none"> • Advantages of Mechanical Working Processes. • Difference Between Hot and Cold Working. 	4 th ,5 th	4

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	Process and Use.	<ul style="list-style-type: none"> Advantages and Disadvantages of Cold and Hot Working Processes. Classification of Metal Forming Processes According to Type of Stress Employed. 		
5.	Forging Process.	<ul style="list-style-type: none"> Classification of Forging. Die Forging with Power Hammers (Open, Impression, Closed Die Forging). Machine Forging. Forging Defects. 	6 th	2
6.	Rolling Process.	<ul style="list-style-type: none"> Nomenclature of Rolled Products. Mechanism of Rolling. Types of Rolling Mills. Rolls and Roll Pass Design. Ring Rolling. Cold Rolling Rolling Defects. 	7 th	2
7.	Mid-Term Exam.	<ul style="list-style-type: none"> The First 6 Chapters. 	8 th	2
8.	Rolling Process.	<ul style="list-style-type: none"> Nomenclature of Rolled Products. Mechanism of Rolling. Types of Rolling Mills. Rolls and Roll Pass Design. Ring Rolling. Cold Rolling Rolling Defects. 	9 th	2
9.	Extrusion, Wire Drawing, Tube Drawing and Making.	<ul style="list-style-type: none"> Extrusion Processes. Machines for Extrusion. Extrusion Defects. Wire Drawing. Tube Drawing. - Tube Making. 	10 th	2
10.	Press Work and Die-Punch Assembly	<ul style="list-style-type: none"> Tools 	11 th	2

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		<ul style="list-style-type: none"> Other Operations Performed with (Presses, Bending, Deep Drawing, Coining and Embossing Coining). 		
11.	Casting Process.	<ul style="list-style-type: none"> Types of Patterns. Moulding Sand and its Properties. Mould Making Technique (Core, Core Print, Gates, Runners and Risers). Casting Defects. Die Casting. 	12 th ,13 th	4
12.	Welding Process.	<ul style="list-style-type: none"> Gas Welding Process. Welding Operation Arc Welding and Defects. Electric Resistance Welding (Spot, Seam etc). Soldering and Brazing. 	14 th	2
13.	Review.	All the Chapters.	15 th	2
14.	Final Exam.	All the Chapters.	16 th	2
Number of Weeks /and Units Per Semester			16	32

B – Practical Aspect:			
Order	Tasks/ Experiments	Number of Weeks	Contact hours
1.	Lab Session devoted to safety Issues in the manufacturing process.	1 st	2
2.	Material Test Lab	2 nd	2
3.	Measurements Tools – Workshop	3 rd	2
4.	Metal forming lab. (producing a part)	4 th ,5 th	4
5.	Forging Lab.	6 th	2
6.	Rolling Lab. (producing a part)	7 th , 8 th	4
7.	Extrusion Lab.	9 th	2
8.	Press Lab.	10 th	2
9.	Casting Lab.	11 th ,12 th	4
10.	Welding Lab.	13 th ,14 th	4

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Number of Weeks /and Units Per Semester	14	28
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VI. Teaching strategies of the course:
<ul style="list-style-type: none"> - Lectures & Class Activity and Class Attendance. - Workshop Practical Activities (Single/Groups Practical Activities). - Reports for Practical Workshop Training & Lab. Case Study.

VII. Assignments:				
No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Design a part showing the manufacturing sequence using lath and milling machines)	a1,a2,b1,b2,c1,c2	6	7.5
2.	producing the designed part	a1,a2,b1,b2,c1,c2	11	7.5
Total				15

VIII. Schedule of Assessment Tasks for Students During the Semester:				
No.	Type of Assessment Tasks	Week Due	Mark	Proportion of Final Assessment
1.	Practical projects assessments designing and manufacturing parts using selected manufacturing process.	10	15	10%
2.	Mid-term written exam	8 th	45	30%
3.	Final Exam	14	90	60%
Total			150	100

IX. Learning Resources:	
<ul style="list-style-type: none"> ● <i>Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).</i> 	
1- Required Textbook(s) (maximum two).	
<ol style="list-style-type: none"> 1. John A. Schey (2000), Introduction to Manufacturing Processes, 3rd, Edition, McGraw Hill. 2. G. Boothroyd and W.A. Knight (2006), Fundamentals of Machining and Machine Tools, 3rd edition, CRC Taylor and Francis. 	

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2- Essential References.	
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3- Electronic Materials and Web Sites etc.	
	1. Internet engine Search – Manufacturing Process Topics. 2. Video Cassettes / CDS. 3. Learning Materials Transparencies

X. Course Policies:	
1.	Class Attendance: -A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic
2.	Tardy: - For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.
3.	Exam Attendance/Punctuality: - A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.
4.	Assignments & Projects: - The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5.	Cheating: - For cheating in exam, a student will be considered as failure . In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6.	Plagiarism: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proved a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7.	Other policies:

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 Asst. Prof. Dr.
 Adel Ahmed
 Al-Shakiri

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 Unit
 Assoc. Prof. Dr.
 Mohammad
 Algorafi

Dean of the Faculty
 Prof. Dr. Mohammed
 AL-Bukhaiti

Academic
 Development
 Center & Quality
 Assurance
 Assoc. Prof. Dr.
 Huda Al-Emad

Rector of Sana'a
 University
 Prof. Dr. Al-Qassim
 Mohammed Abbas



	<ul style="list-style-type: none"> - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. <p>Lecture notes and assignments my given directly to students using soft or hard copy</p>
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