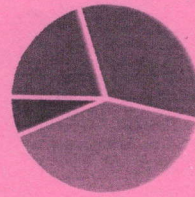


CO1	The students will be able to apply interpolation methods and find approximate solution of algebraic and transcendental equations.
CO2	The students will be able to compute several statistical measures and analyze any given bivariate data.
CO3	The students will be able to deal with the treatment of random variables and their probability distributions.
CO4	The students will be able to apply Statistical techniques of the Analysis of Variance and the Designs of Experiments.
CO5	The students will be able to have idea of Queuing system and Queuing Models.

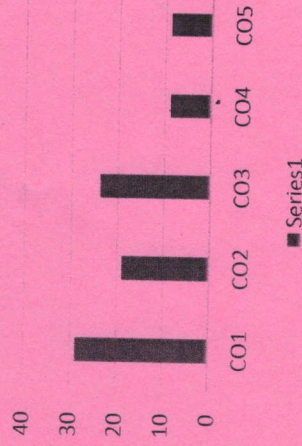
**GRAPHICAL REPRESENTATION**

Bloom's Level wise Marks distribution



■ Level 1 ■ Level 2 ■ Level 3  
■ Level 4 ■ Level 5 ■ Level 6

Course outcome wise Marks distribution



Program	M. Tech	Branch	EVT/MS/CSE
Subject Name	Advanced Engineering Mathematics and Experimental methods		
Semester	1 <sup>st</sup>	Session	Odd, 2025-26
		Year	Jan, 2026
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> <li>Start writing from 2nd page onwards; don't Write on the 1st Page Backside</li> <li>Answer all Questions of Section A (Compulsory)</li> <li>Answer Any Four out of Six of Section B</li> <li>Answer Any Three out of Five of Section C</li> <li>Possession of <u>Mobile Phone</u> or any kind of <u>Written Material, Arguments with the Invigilator or Discussion with Co-Student</u> will come under <u>Unfair Means</u> and will <u>Result in the Cancellation of the Paper(s)</u>.</li> </ul>		
Knowledge Level (KL)	K1 : Remembering	K3 : Applying	K5 : Evaluating
	K2 : Understanding	K4 : Analysing	K6 : Creating

**Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)**




Q. N	QUESTIONS	Marks	COs	KL
i	Define Interpolation with unequal intervals.	2	CO1	K1
ii	Write down formula for finding approximate root under Newton-Rapson method.	2	CO1	K1
iii	Write down the limits of Rank correlation coefficient.	2	CO2	K1
iv	Define regression coefficients in regression analysis.	2	CO2	K2
v	Compute the probability of getting exactly two heads in tossing three coins simultaneously.	2	CO3	K3
vi	What are the parameters of binomial distribution?	2	CO3	K2
vii	What is meant by one-way classification of Analysis of Variance?	2	CO4	K3
viii	Randomized Block Design is which case of classification of analysis of variance?	2	CO4	K4
ix	Explain the term Balking used in Queuing Theory.	2	CO5	K1
x	What is meant by single channel service in Queuing Theory.	2	CO5	K2

**Section B (Answer any FOUR out of SIX) - 20 Marks**  
(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	Establish the relation $\Delta = E - 1$	5	CO1	K3
3	The coefficient of rank correlation between marks in Statistics and marks in Mathematics obtained by a certain group of students is 0.8. If the sum of the squares of differences in ranks is given to be 33, find the number of students in the group.	5	CO2	K5
4	A coin is tossed 10 times. Find the probability of getting exactly 8 heads.	5	CO3	K5
5	What is random variable? Explain discrete and continuous random variables.	5	CO3	K2
6	Explain Analysis of Variance	5	CO4	K2
7	What do you understand by Queuing Theory and Queuing system?	5	CO5	K2

**Section C (Answer any THREE out of FIVE) - 30 Marks**  
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
8	Given that $f(0) = 8$ , $f(1) = 68$ , $f(3) = 123$ and $f(4) = 230$ construct a divided difference table and determine the value of $f(2)$ .	10	CO1	K5
9	Describe Newton-Rapson method for solving Algebraic or Transcendental equation.	10	CO1	K3
10	For 10 observations on price (X) and supply (Y) the following data were obtained (in appropriate units), $\sum X = 130$ , $\sum Y = 220$ , $\sum X^2 = 2288$ , $\sum Y^2 = 5506$ and $\sum XY = 3467$ . Obtain the line of regression of Y on X and estimate the supply when the price is 16 units.	10	CO2	K5
11	A continuous random variable X follows the probability law: $f(x) = Ax$ , $0 \leq x \leq 2$ Determine A and find the probability that a. X lies between 0.5 and 0.8 b. X is less than 1.4	10	CO3	K5
12	Discuss Randomization, Replication and Local Control in Design of Experiment.	10	CO4	K2

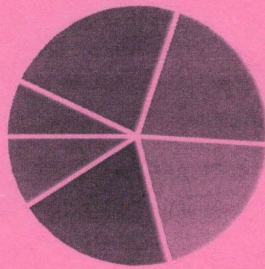
			<b>END SEM EXAMINATION</b> <b>School of Engineering &amp; IT</b>	
			<b>Branch</b> Manufacturing Engineering	<b>Program</b> M.Tech
<b>Subject Name</b> Advanced Management Techniques in Manufacturing			<b>Semester</b> 1 <sup>st</sup>	<b>Year</b> 2025/ODD
<b>Time: 3 Hour</b> <b>Max. Marks : 70</b>			<b>Start writing from 2nd page onwards; don't Write on the 1st Page Backside</b>	
<ul style="list-style-type: none"> <li>Answer all Questions of Section A (Compulsory)</li> <li>Answer Any Four out of Six of Section B</li> <li>Answer Any Three out of Five of Section C</li> </ul>			<ul style="list-style-type: none"> <li>Possession of Mobile Phone or any kind of Written Material, Arguments with the Invigilator or Discussion with Co-Student will comes under <b>Unfair Means</b> and will <b>Result in the Cancellation of the Paper(s)</b>.</li> </ul>	
<b>Knowledge Level (KL)</b>		<b>K1 : Remembering</b> <b>K2 : Understanding</b>	<b>K3 : Applying</b> <b>K4 : Analysing</b>	<b>K5 : Evaluating</b> <b>K6 : Creating</b>

Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)				
Q. N	QUESTIONS	Marks	COs	KL
i	What is the primary purpose of Just-In-Time (JIT) manufacturing?	2	CO1	KL1
ii	What are the key functionalities of CPC in industrial applications?	2	CO2	KL2
iii	Define CPC (Computer Process Control)	2	CO3	KL3
iv	What is the role of Quality Control (QC) and Quality Assurance (QA) in JIT?	2	CO4	KL2
v	What is the Toyota Production System (TPS)	2	CO5	KL1
vi	What is a Kanban, and why is it important in TPS?	2	CO1	KL2
vii	What is the impact of scrap reduction on quality improvement in JIT?	2	CO2	KL3
viii	What are the key elements of the Total Quality Control (TQC) concept?	2	CO3	KL3
ix	What is the role of QC Circles in improving production quality?	2	CO4	KL4
x	Define plant configuration and explain its significance in JIT production.	2	CO5	KL3

CO- Course Outcomes,	KL- Knowledge Level,	PO – Program Outcome
CO1	Demonstrate the concept of JIT their types, principles and application through real timeexamples	
CO2	Assess types of JIT for different manufacturing system making scheduling and sequencing aneasy process	
CO3	Demonstrate sequential withdrawal system through real time examples	
CO4	Have awareness of how Kanban is implemented in Toyota is enlightened to all users.	
CO5	Distinguish between various chain initiative production planning and demand fluctuation	
CO6	Demonstrate the concept of JIT their types, principles and application through real timeexamples	

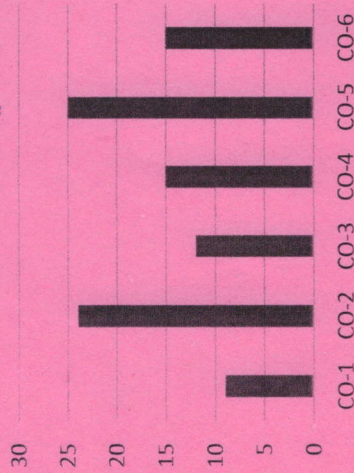
### GRAPHICAL REPRESENTATION

**Bloom's level wise Marks Distribution**



■ K1 ■ K2 ■ K3 ■ K4 ■ K5 ■ K6

**Course Outcome wise Marks Distribution**



**Section B (Answer any FOUR out of SIX) – 20 Marks**  
(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	How can the implementation of JIT impact CPC?	05	CO1	KL3
3	How can businesses use CPC to improve profitability?	05	CO2	KL3
4	Explain the primary purpose of the Just-in-Time (JIT) production system. How does JIT help businesses reduce costs and increase profitability?	05	CO3	KL4
5	Discuss the importance of sequencing and scheduling in JIT. How do monthly and daily supplier schedules contribute to the efficiency of the production process?	05	CO4	KL6
6	How do you determine the number of Kanbans needed in a production system?	05	CO5	KL5
7	How can subcontractors be integrated into the TPS for smooth production flow?	05	CO1	KL5

**Section C (Answer any THREE out of FIVE) – 30 Marks**  
(Each question Carry 10 Marks)

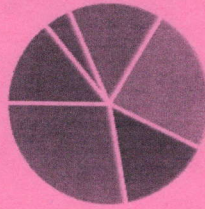
Q. No.	QUESTIONS	Marks	COs	KL
8	Explain the relationship between CPC and JIT in the context of cost reduction and efficiency. How can the implementation of JIT impact CPC?	10	CO1	KL 6
9	What role does standardization play in JIT? How does standardizing operations improve efficiency and reduce waste in production?	10	CO2	KL 4
10	What is production smoothing in TPS, and why is it important for managing demand fluctuations?	10	CO3	KL 2
11	Explain the concept of plant configuration and its influence on production efficiency.	10	CO4	KL 3
12	Describe the Total Quality Control (TQC) concept, including its goals, process, and implementation.	10	CO5	KL 6

CO- Course Outcomes, KL- Knowledge Level, PO – Program Outcome

CO1	Learn about a working principle and construction of Additive Manufacturing
CO2	Apply Knowledge to support design and manufacturing, modern development in additive manufacturing process
CO3	Assess and implement AM techniques for specific application leading to better ROI for the company that uses Laser AM machines
CO4	Enhance the production sequence of tooling process by choosing the correct material for the job
CO5	Develop and incorporate the productivity sequence by choosing the right AM technology

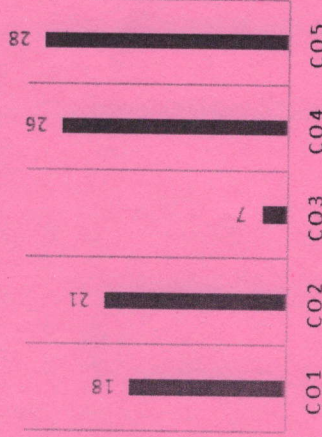
### GRAPHICAL REPRESENTATION

#### Bloom's Level wise Marks Distribution



■ K1 ■ K2 ■ K3 ■ K4 ■ K5 ■ K6

#### Course Outcome Wise Marks Distribution



**ARKA JAIN University**  
Jharkhand



END SEM EXAMINATION  
School of Engineering & IT

<b>Program</b>	M. Tech	<b>Branch</b>	Manufacturing Engineering
<b>Subject Name</b>	Additive Manufacturing	<b>Session</b>	Odd, 2025-26
<b>Semester</b>	1 <sup>st</sup>	<b>Year</b>	Jan, 2026
<b>Time: 3 Hour</b> <b>Max. Marks : 70</b>	<ul style="list-style-type: none"> <li>Start writing from 2nd page onwards; don't Write on the 1st Page Backside</li> <li>Answer all Questions of Section A (Compulsory)</li> <li>Answer Any Four out of Six of Section B</li> <li>Answer Any Three out of Five of Section C</li> <li>Graph Paper / Drawing Sheet/ Log Book/ Ledger (Not Required)</li> <li>Possession of Mobile Phone or any kind of Written Material, Arguments with the Invigilator or Discussion with Co-Student will come under Unfair Means and will Result in the Cancellation of the Paper(s).</li> </ul>		
<b>Knowledge Level (KL)</b>	K1 : Remembering K2 : Understanding	K3 : Applying K4 : Analysing	K5 : Evaluating K6 : Creating

### Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)

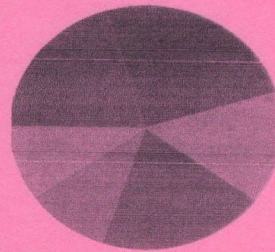
Q. N1	QUESTIONS	Marks	COs	KL
i	List up the different additive manufacturing techniques.	2	CO1	K2
ii	Describe the concept of Reverse Engineering and its applications.	2	CO2	K1
iii	List and classify the materials commonly used in rapid prototyping.	2	CO2	K3
iv	Explain the process of photo polymerization and its role in additive manufacturing.	2	CO1	K4
v	Define Additive Manufacturing with suitable examples.	2	CO3	K1
vi	Explain the significance of additive manufacturing in modern industries.	2	CO3	K5

vii	Analyze the importance of Reverse Engineering in product development.	2	CO2	K4
viii	Evaluate the suitability of different materials for rapid prototyping based on their properties	2	CO2	K5
ix	Design an experiment to study the effects of photo polymerization parameters on final product quality.	2	CO2	K6
x	Develop a structured flowchart to illustrate the 3D printing process	2	CO2	K6
<b>Q. No.</b>	<b>QUESTIONS</b>	<b>Marks</b>	<b>COs</b>	<b>KL</b>
2	Examine the different modes of the Directed Energy Deposition process.	5	CO1	K2
3	Differentiate between additive manufacturing and CNC machining.	5	CO2	K1
4	Analyse the reverse engineering process in the context of additive manufacturing.	5	CO3	K3
5	Describe the process for preparing CAD models for 3D printing.	5	CO4	K2
6	Discuss the role of lasers in Laser Rapid Manufacturing.	5	CO5	K3
7	Explain the role of 3D printing in the present scenario.	5	CO3	K3
<b>Section C (Answer any THREE out of FIVE) - 30 Marks</b>				
<b>(Each question Carry 10 Marks)</b>				
<b>Q. No.</b>	<b>QUESTIONS</b>	<b>Marks</b>	<b>COs</b>	<b>KL</b>
8	Explain the complete process of additive manufacturing with the help of a flowchart.	10	CO1	K1
9	Identify and describe the different types of additive manufacturing processes.	10	CO2	K3
10	Analyze how effective 3D components can be produced using the Powder Bed Fusion process. Explain in detail.	10	CO3	K3
11	Define cladding and explain the laser cladding process in additive manufacturing.	10	CO4	K4
12	Describe the process of laser-based joining of metallic and non-metallic materials in terms of its effectiveness and applications.	10	CO5	K5

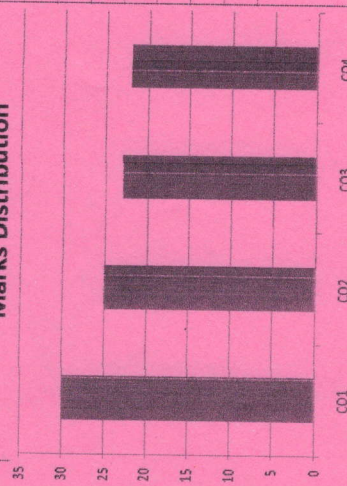
CO1	Apply the gained Knowledge in the field of material and to differentiate properties with respect to conventional material
CO2	Select suitable powder production methods for different materials in order to get the required components.
CO3	Select suitable production technique for composite material.
CO4	Analyse and obtain stiffness and compliance matrix and also study strength parameters of lamina.
CO5	Apply the knowledge in the field of materials and to differentiate with conventional and advanced material.

### GRAPHICAL REPRESENTATION

**Blooms Level wise marks Distribution**



**Course Outcome Wise Marks Distribution**



**ARKA JAIN**  
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Jharkhand

**NAAC**  
GRADE  
ACCREDITED UNIVERSITY

END SEM EXAMINATION  
School of Engineering & IT

Program	M. Tech	Branch	Manufacturing Engineering
Subject Name	Advanced Material Technology	Session	Odd, 2025-26
Semester	1 <sup>st</sup>	Year	Jan, 2026
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> <li>Start writing from 2nd page onwards; don't Write on the 1st Page Backside</li> <li>Answer all Questions of Section A (Compulsory)</li> <li>Answer Any Four out of Six of Section B</li> <li>Answer Any Three out of Five of Section C</li> <li>Possession of Mobile Phone or any kind of Written Material, Arguments with the Invigilator or Discussion with Co-Student will come under Unfair Means and will Result in the Cancellation of the Paper(s).</li> </ul>		
Knowledge Level (KL)	K1 : Remembering K2 : Understanding	K3 : Applying K4 : Analysing	K5 : Evaluating K6 : Creating

### Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)



Q.N	QUESTIONS	Marks	COs	KL
1				
i	Enlist the name of different types of steel with example.	2	CO1	K1
ii	Draw cooling curve of Iron.	2	CO1	K1
iii	List out the name of different properties of materials.	2	CO2	K4
iv	Differentiate Metal and Alloy with examples	2	CO3	K2
v	Write down the name of different types of composite materials	2	CO2	K4
vi	Enlist the name of different types of metal and nonmetals.	2	CO3	K5
vii	Write a short note on Metal matrix Composites (MMC) a	2	CO2	K2
viii	Define Ceramic Matrix Composites (CMC)	2	CO3	K3
ix	Define Unit Cell and Crystal Structure.	2	CO4	K4
x	Discuss powder metallurgy manufacturing process	2	CO4	K4

**Section B (Answer any FOUR out of SIX) – 20 Marks**  
(Each question Carry 05 Marks)

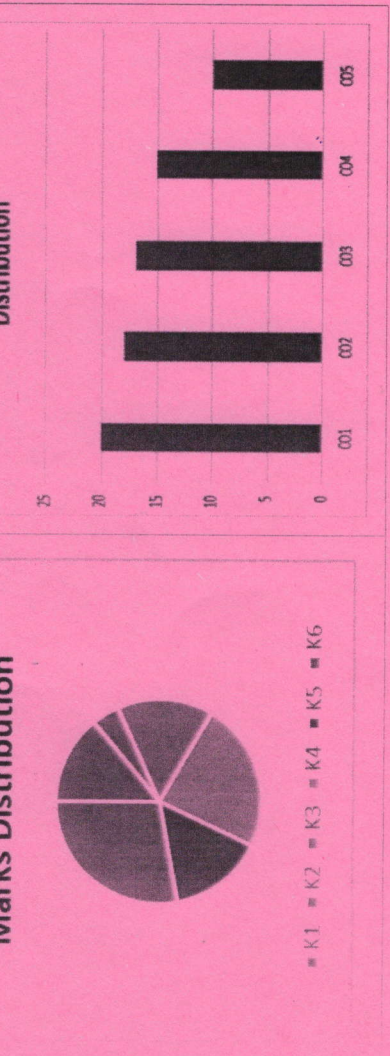
Q. No.	QUESTIONS	Marks	COs	KL
2	Write a short note on different properties of engineering materials.	5	CO1	K2
3	Explain processing of composite materials with suitable examples	5	CO1	K3
4	Write a short note on Steps Involved in powder metallurgy with suitable examples.	5	CO2	K4
5	Differentiate Metal matrix Composites (MMC) and Ceramic Matrix Composites (CMC)	5	CO2	K4
6	Elaborate classification of engineering materials with examples.	5	CO3	K4
7	Define polymer and Differentiate Thermosetting and Thermoplastic with examples.	5	CO4	K5

**Section C (Answer any THREE out of FIVE) – 30 Marks**  
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
8	Elaborate any 5 types of Engineering materials properties with ASTM Test procedure.	10	CO2	K5
9	Explain any one of powder metallurgy Process with suitable examples.	10	CO1	K2
10	Elaborate Metal matrix Composites (MMC) with suitable diagram	10	CO3	K3
11	Differentiate Metal and Alloy with examples, Write down the name of different types of composite materials	10	CO4	K5
12	Differentiate Thermosetting and Thermoplastic with examples. Explain processing methods of Polymer.	10	CO4	K1

 		<b>END TERM EXAMINATION</b> <b>School of Engineering &amp; IT</b>	
Branch	Manufacturing Engineering	Program	M. Tech
Subject Name	Fundamentals of Metal cutting and NTM	Semester	1 <sup>st</sup>
		Year	2026
Time: 3 Hour Max. Marks : 70	<ul style="list-style-type: none"> <li>Start writing from 2nd page onwards; <b>don't Write on the 1st Page Backside</b></li> <li><b>Answer all Questions of Section A (Compulsory)</b></li> <li><b>Answer Any Four out of Six of Section B</b></li> <li><b>Answer Any Three out of Five of Section C</b></li> <li><b>Possession of Mobile Phones or any kind of Written Material, Arguments with the Invigilator or Discussing with Co-Student will come under Unfair Means and will Result in the Cancellation of the Papers.</b></li> </ul>		
Knowledge Level (KL)	K1 : Remembering K2 : Understanding	K3 : Applying K4 : Analysing	K5 : Evaluating K6 : Creating

Q. N 1	QUESTIONS	Mar ks	COs	KL	PO
i	What is metal cutting process?	2	CO1	K1	PO2
ii	What do you understand by additive and subtractive manufacturing?	2	CO2	K1	PO2
iii	What is the effect of negative rake angle in metal cutting?	2	CO2	K2	PO3
iv	Name any two cutting tool materials.	2	CO1	K2	PO2
v	What are the criteria of producing continuous chips during machining?	2	CO3	K2	PO2
vi	Name any two Mechanical Type Non Traditional Machining Process.	2	CO3	K3	PO3
vii	What is the role of clearance angle in metal cutting?	2	CO2	K3	PO2
viii	How to eliminate formation of continuous chip built up edge?	2	CO2	K4	PO3



CO- Course Outcomes,	KL- Knowledge Level,	PO – Program Outcome
CO1	Identify the various types of cutting tools, mechanics of metal cutting, tool materials.	
CO2	Explain the concepts and derive the relationships for shear plane angle, cutting forces, tool life criterion, and effective utilization of the tools, towards decision making processes illustrate them	
CO3	Classify and analyze the different dynamometers for measuring forces considering Case studies –Draw conclusions	
CO4	Understand the importance of non-traditional machining over traditional machining process	
CO5	Decide the best hybrid process and take appropriate decision for live problems faced in the industries especially for machining operations	

**GRAPHICAL REPRESENTATION**

ix	Classify thermal type NTM processes.	2	CO2	K2	PO3
x	What are the need of using NTM Processes?	2	CO4	K3	PO3

**Section B (Answer any FOUR out of SIX) – 20 Marks**

(Each question 5 Marks)

No.	QUESTIONS	Marks	COs	KL	PO
2	Why machining process are called as value addition process".	5	CO1	K2	PO1
3	Write a note on different types of cutting tool materials.	5	CO2	K1	PO2
4	What do you understand by tool life? Explain the tool life with help of Taylor's tool life equation.	5	CO3	K3	PO1
5	Write difference between traditional and non-traditional machining.	5	CO4	K2	PO2
6	Classify the different non-traditional machining process and also comment on their process capabilities.	5	CO5	K3	PO2
7	What is the role of cutting fluid in machining? Enlist them.	5	CO3	K3	PO1

**Section C (Answer any THREE out of FIVE) – 30 Marks-**

(Each question Carry 10 Marks)

No.	QUESTIONS	Marks	COs	KL	PO
8	Explain the tool nomenclature of single point cutting tool in ASA system.	10	CO1	K1	PO1
9	Explain the mechanism of chip formation with suitable diagram.	10	CO2	K3	PO2
10	What do you understand by tool wear? Explain types of tool wear.	10	CO3	K3	PO1
11	Explain the Abrasive Water Jet Machining Process with suitable diagram.	10	CO4	K4	PO2
12	Explain working principle, elements, advantages, limitation and application areas of Ultra-Sonic	10	CO5	K5	PO2