

**MATHEMATICAL SOCIETY
OF SOUTH EASTERN EUROPE**
+
CYPRUS MATHEMATICAL SOCIETY



MASSEE Meeting and SEEMOUS Event
SEEMOUS 2016
South Eastern European Mathematical Olympiad
for University Students
Protaras, Cyprus
1-6 March 2016

Organizers and Hosts
Mathematical Society of South-Eastern Europe
and
Cyprus Mathematical Society

in cooperation with the

Department of Mathematics and Statistics
of the University of Cyprus

Under the auspices of the Minister of Education and Culture of Cyprus

SEEMOUS2016 Organizing Committee

Gregory Makrides (President of MASSEE and
Chairman of Local Organizing Committee)
Giorgros Kyriazis – University of Cyprus (Deputy-Chair)
Pantelis Damianou (Chief Problem Coordinator)
Sava Grozdev (Deputy Chief Problem Coordinator)
Nikos Stylianopoulos, Problem Coordinator
Smyrlis Giorgos, Problem Coordinator
Athanasios Gagatsis, VP, Cyprus Math Society
Andreas Philippou, General Secretary, Cyprus Math Society
Theoklitos Parayiou, Problem Coordinator
Sotiris Loizias, Problem Coordinator
Savvas Timotheou, Problem Coordinator
Andreas Skotinos, Problem Coordinator
Dimitris Karantanos, Programme Coordinator
Andreas Demetriou, Problem Coordinator
Kyriakos Matheou, Programme Coordinator
Constantinos Papayiannis, Programme Coordinator
Constantinos Koumis, Programme Coordinator
Kyriakos Konstantinides, Programme Coordinator
Andreas Savvides, Programme Coordinator
Stelios Kouzaris, Coordinator
Charalambos Evripidou, Coordinator
Demetres Christofides, Coordinator

The Jury of SEEMOUS 2016

Gregoris A. Makrides (Chairman) (JURY1)
Pantelis Damianou, Cyprus (Chief Problem Coordinator) (JURY2)
Sava Grozdev, MASSEE (Deputy Chief Problem Coordinator) (JURY3)
Rus Mircea Dan, Technical University of Cluj-Napoca, Romania (ROM1-L01)
Băețica Cornel-Claudiu, University of Bucharest, Romania (ROM2-L01)
Ioana Luca, University Politehnica of Bucharest, Romania (ROM3-L01)
Trif Tiberiu, Babes-Bolyai University Cluj-Napoca, Romania (ROM4-L01)
Papadopoulos Vaselios, Dept of Civil Eng, Democritus Univ of Thrace-Team 1,
Greece (HEL1-L01 and HEL2-L01)
Brazitikos Silouanos, National and Kapodistrian University of Athens, Greece (HEL3-L01)
Roman Marcel Romică, Technical University “Gheorghe Asachi” of Iași, Romania (ROM5-L01)
Stoev Petar, Univ. of Architecture, Civil Engineering and Geodesy – Team 1, Bulgaria (BLG1-L01)
Todorov Vladimir, Univ of Architecture, Civil Eng and Geodesy – Team 2, Bulgaria (BLG2-L01)
Gurbanov Pirmyrat, National Team of Turkmenistan, Turkmenistan (TKM1-L01)
Corina Forascu, Alexandru Ioan Cuza Univ of Iasi, Faculty of Computer Science-Team 1, Romania (ROM6-L01
and ROM7-L01)
Rakhimov Karim, National University of Uzbekistan, Uzbekistan (UZB1-L01)
Todor Dimitrov Todorov, Technical University of Gabrovo, Bulgaria (BLG3-L01)
Gurbanmammedov Nurmuhammet, Magtymguly Turkmen State Univ, Turkmenistan (TKM2-L01)
Sanja Kostadinova Atanasova, Ss.Cyril and Methodius University, (FYR1-L01)
TBA, Ovidius University Constantza, Romania, Romania (ROM8-L01)

**THE MASSEE EVENT
SOUTH EASTERN EUROPEAN MATHEMATICAL OLYMPIAD FOR
UNIVERSITY STUDENTS**

SEEMOUS 2016



OPENING CEREMONY

16.00-17.00 Wednesday 2 March, 2016
University of Cyprus, Nicosia
Leventis Building, Room B108

Welcoming address:

◆ **Dr Gregory Makrides**
President-Cyprus Mathematical Society
President-MASSE
Chairman of the Jury

Greetings

◆ **Prof. Giorgos Kyriazis**, Head
Department of Mathematics and Statistics, University of Cyprus

◆ **Prof. Constantinos Christofides**,
Rector of the University of Cyprus

Opening

Prof. Costas Kadis
Minister of Education and Culture of Cyprus

Reception

University of Cyprus
University House A.G. Leventis

**MASSEE EVENT
SEEMOUS 2016
PARTICIPATING DELEGATIONS**

- CYP1-University of Cyprus, Cyprus
UKD1-University College London, UK
ROM1-Technical University of Cluj-Napoca, Romania
ROM2-University of Bucharest, Romania
ROM3-University Politehnica of Bucharest, Romania
ROM4-Babes-Bolyai University Cluj-Napoca, Romania
HEL1-Department of Civil Engineering, Democritus University of Thrace-Team 1 , Greece
HEL2-Dept of Electrical and Computer Engineering, Democritus University of Thrace –Team2, Greece
HEL3-National and Kapodistrian University of Athens, Greece
ROM5-Technical University “Gheorghe Asachi” of Iași, Romania
BLG1-University of Architecture, Civil Engineering and Geodesy – Team 1, Bulgaria
BLG2-University of Architecture, Civil Engineering and Geodesy – Team 2, Bulgaria
HEL4-Aristotle University of Thessaloniki, Greece
TKM1-National Team of Turkmenistan
ROM6-Alexandru Ioan Cuza University of Iasi, Faculty of Computer Science-Team 1, Romania
ROM7-Alexandru Ioan Cuza University of Iasi, Faculty of Computer Science-Team 2, Romania
UZB1-National University of Uzbekistan
BLG3-Technical University of Gabrovo, Bulgaria
TKM2-Magtymguly Turkmen State University, Turkmenistan
IRN1-Petroleum University of Technology, Iran
FYR1-Ss.Cyril and Methodius University, FYR-Macedonia
ROM8-Ovidius University Constantza , Romania

MASSEE EVENT

**SOUTH EASTERN EUROPEAN MATHEMATICAL OLYMPIAD FOR
UNIVERSITY STUDENTS**

SEEMOUS 2016



AWARDS CEREMONY

18.30 -20.00 Saturday 5 March

“Constantinos the Great” Beach Hotel, Protaras

Results of the SEEMOUS 2016

Dr Gregory Makrides
Chairman of the Jury,
President of the Cyprus Mathematical Society and
President of MASSEE

Invitation to the SEEMOUS 2017

Closing Greetings

Mayor of the Municipality of Paralimni, Ammohostos

Awarding of prizes

Coordinated by Dr Gregory Makrides
Chairman of the Jury

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Southeastern European Mathematical Olympiad for University Students SEEMOUS

REGULATIONS *(33 articles)*

These regulations were approved by the MASSEE (Mathematical Society of South Eastern Europe) on 1st April 2006.

1. The aims of the SEEMOUS include.
 - a. The challenging, encouragement and development of mathematically gifted higher education students in all participating institutions and corresponding countries;
 - b. The fostering of friendly relationships among higher education students and educators of the participating institutions;
 - c. The creation of opportunities for the exchange of information on higher education syllabi and the development of partnerships and networks between the participating institutions;
 - d. The development of young researchers in mathematics and its applications.
2. The official language of the SEEMOUS is English.
3. The SEEMOUS is organized once every year within the first 15 days of the month of March.
4. Countries or universities interested to host SEEMOUS should apply to MASSEE at least 15 months before the date of organization.
5. The SEEMOUS Jury shall consist of all leaders of the participating teams representing an institution.
6. New participants have to be accepted by MASSEE at least three months before participation.
7. Teams represent institutions but results per country will be computed for teams of six students made up by the best six scores of students participating from each country, except if a National team is officially participating. The National teams have to be specified, in writing, by the national Mathematical Society or the Ministry of Education of the country.
8. All decisions by the Jury are based on simple majority unless it is otherwise specified. The Chairman may vote only when a tie break is needed.
9. The Jury could decide to suggest changes to the regulations. Suggestions are submitted to MASSEE by the chairman of the Jury for changes to be applicable from the next Olympiad. Changes in the regulations can only be approved by MASSEE.
10. Deputy leaders may participate in the Jury and they may also replace their leaders in his/her absence.
11. Each participating institution has one vote regardless of the size of their team.
12. National teams can participate with students not representing institutions or a mixture. If a national team participates with a leader then the leader becomes a member of the jury and has one vote.

13. The minutes of the Jury meeting are approved at the last meeting of the jury and before the closing of SEEMOUS. The Chairman of the Jury of the SEEMOUS is obliged to give the minutes of the Jury meetings to all leaders and to send them to the MASSEE Council.
14. The Jury may consider and decide on any matter raised, which is not covered by any other regulation item, provided that such decision does not violate the constitution of MASSEE.
15. Additional regulations may be added by the Jury, in which case at least two thirds majority is needed. New regulations become effective beginning the next SEEMOUS, provided they are approved by the MASSEE Council.
16. The Chairman of the Jury may call as many day meetings as he/she deems necessary during an SEEMOUS or when at least one third of the participating institutions or national representations request an additional Jury meeting.
17. Proposals to host an SEEMOUS are discussed during a Jury meeting and recommended to MASSEE by the Jury in an order of preference. The MASSEE shall always approve the host countries/institutions of the next two SEEMOUS.
18. Invitations for participation are sent by MASSEE at least two months before the contest day and it should include:
 - a. An invitation up to six students from each institution is sent by MASSEE. Students must be higher education students, who did not complete 120 ECTS (European Credit Transfer System) or the equivalent by the date of the Olympiad;
 - b. An invitation for up to two educators(leader and deputy leader);
 - c. A call for up to three problem proposals with a deadline of one month before the contest date;
 - d. All participants in SEEMOUS will have to cover their own travel, accommodation and subsistence. A participation fee to cover accommodation and subsistence will be determined every year according to the host country and institution. All payments are pre-paid to the local organizer as approved by MASSEE.
19. The SEEMOUS contest shall take place during one day and should have duration of 5 hours. The contest paper shall consist of four problems, each carrying 10 points for a total of 40 points maximum.
20. Each country/institution except the host institution can propose up to three problems and they should be mailed to MASSEE special Jury secretariat at least one month before the day of the contest. The proposed problems should include their solutions and the field of mathematics that are covering. The proposed problems are given to the Problem Selection Committee appointed by MASSEE.
21. The Problem Selection Committee should make a short list of at most 50, but not less than 20 of the problems proposed and present it to the Jury for a final problem selection. The rest of the proposed problems are kept confidential and returned to the team leader of the country/institution, which has proposed them.
22. The days before the contest, the leaders, the Jury and members of the Problem Selection Committee shall meet and accommodate at a place different and at distance from the place where students stay. During this meeting, the final contest paper will be decided and approved, translated into different languages and approved and multiplied for the contest. No member of this Committee may communicate by any means with any person other than the members of this meeting and no telephone calls will be allowed until the contest begins. If it is found absolutely necessary for someone to make a phone call, then this will have to be done at the presence of at least two leaders from different countries/institutions other than one hosting the SEEMOUS.
23. Each student contestant will submit solutions in the English language. Solutions may be written only on paper provided by the Organizing Committee.
24. Each student contestant must work independently. Violation of this provision will result in disqualification of the student contestant from the SEEMOUS. The hosting country/institution should make provisions for preventing the use of any dishonest means during the contest.

25. Student contestants are not permitted to bring any books or papers or calculators into the examining rooms. The only instruments permitted in the contest are writing and mechanical drawing instruments. Any student contestant making use of any prohibited item may be disqualified from the SEEMOUS.
26. During the first half-hour, only, of the examination period, each student contestant may submit, on special notepaper provided, written questions for considerations by the Jury. Each paper with such questions shall be given, first to the Chairman of the Jury, and then to the team leader of the country from which the student comes. The leader will translate the question into English and will propose an answer. If the Jury approves the answer, the leader will write the answer on the paper with the student contestant question. This paper shall be given to the Chairman of the Jury for verification before it is returned to the student contestant who submitted the question.
27. The student contestant's solutions will be assessed in a group evaluation process where all leaders and deputy leaders will participate. The official scores are decided by the coordinators of each problem.
28. Problem coordinators will be appointed for each problem, whose responsibility will be to accept and discuss appeals by leaders for assigned scores and correct scores, if necessary. A leader may appeal an assigned score for a specific problem to the Coordinator of the specific problems. If the two cannot agree, the appeal and the reason for rejecting the appeal will be forwarded to the Chief Coordinator who makes the final decision. Final decisions of the Chief Coordinator are accepted by the Jury by default.
29. The type of prizes to be awarded are: Gold Medal, Silver Medal and Bronze Medal. Special prizes may be awarded for particularly meritorious and elegant solutions. A certificate of Honorable Mention shall be awarded to each student contestant who does not receive a prize and who has obtained full marks on at least one question. The total number of prizes will not exceed two thirds of the total number of student contestants participating and the Gold, Silver and Bronze medals will be distributed in a ratio closely approximating 1:2:3. A Certificate of Participation shall be given to all student contestants.
31. The schedule of an SEEMOUS should not exceed 6 nights and may look like the following:
 - 1st day: Arrival and Jury meeting.
 - 2nd day: Opening Ceremony and Jury meeting for problem selection.
 - 3rd day: Contest Day. Papers are saved, approved by the Chairman of the Jury and numbered. Names are hidden.
 - 4th day: Marking of papers by the leaders and deputy leaders.
Jury meeting to approve results and medals.
 - 5th day: Excursion and awards day
 - 6th day: Departure.
32. Each hosting institution or country must ensure quality of accommodation and food to reflect the payment of the participants. Also, it has to ensure free use of Computer facilities and Internet access, free copy service and a free excursion for all.
33. No hosting institution can violate or modify a regulation without the agreement of MASSEE.

SAMPLE DOCUMENTS FOR THE CONTESTANTS

1. Instructions to contestants
2. Sample question paper
3. Sample scratch paper

South Eastern European Mathematical Olympiad for University students *SEMOUS2016*

Instructions to contestants

1. You have an answer booklet with 30 pages. Write your name and other information on the top right box of the cover page. Before submitting your paper answers a proctor will help you hide your name with a special sticker.
2. Do not write your name or any sign indicating your identity to any other part of the answer booklet, inside or outside.
3. All answers/solutions must be presented in the English language using black or blue ink pen. Pencil may be used for figures. Answers can only be written inside the booklet. Begin the answer to a new problem in a new page. Write the problem number on the top of every page.
4. During the first 30 min of the contest you have the right to ask clarification questions. These questions will have to be written on a blue paper provided, preferably in the English language. The blue pages should be left on your desk after you finish.
5. You cannot leave the examination room before 30 min are passed.
6. Yellow paper is only used for scratch work and you have to leave it on your desk after you finish.

QUESTION SHEET

SEEMOUS 2016

9.30-14.30 , Thursday, 3 March 2016

Name of contestant _____

Code _____

PROBLEM NUMBER

write on this side only

Question

BLUE PAPER

SAMPLE

Reply

SCRATCH PAPER

SEEMOUS 2016

9.30-14.30 , Thursday, 3 March 2016

Name of contestant _____

YELLOW PAPER

SAMPLE

SEEMOUS 2016

DETAILED PROGRAMME

**MATHEMATICAL SOCIETY OF SOUTH EASTERN EUROPE
CYPRUS MATHEMATICAL SOCIETY**

SEEMOUS 2016

SEEMOUS 2016 PROGRAMME				
		Leaders	Deputies	Contestants
1 March , 2016 Tuesday	7.30-18.00	<i>Arrivals</i> <i>Students and deputy leaders stay at Constantinos the Great Hotel, Protaras</i> <i>Leaders stay at Lordos Beach hotel, Larnaca country</i>		
	18.00-19.00	<i>Handout of shortlisted problems</i>	<i>Study Time</i>	
	19.00-21.00	<i>Dinner at hotel</i>		<i>Dinner at hotel</i>
	21.00-24.00	<i>Jury Meeting at hotel</i> <i>Room TRITON HALL</i>		<i>Study Time</i>
2 March, 2016 Wednesday	07.30-08.30	<i>Breakfast</i>		
	08.30	<i>Transfer to UCLAN University</i>		<i>Study Time</i>
	09.00-12.00	<i>Jury Meeting at UCLAN, Rm CY017</i>		<i>Study Time</i>
	12.00-13.00	<i>Lunch at UCLAN</i>		<i>Lunch at hotel</i>
	13.00-15.00	<i>Jury Meeting at UCLAN, Rm CY017</i>		<i>Visit Nicosia Archaeological Museum</i>
	15.00 – 16.00	<i>Transfer to Opening Ceremony</i>		<i>Transfer to Opening Ceremony</i>
	16.00 – 17.00	<i>Opening Ceremony</i> <i>University of Cyprus Campus, Leventis Building, B108</i>		
	17.00	<i>Transfer to Hotel</i>		<i>Transfer to Hotel</i>
	19.00-20.30	<i>Dinner at hotel</i>		
	20.00-24.00	<i>Jury Meeting, UCLAN, Rm CY017</i>		<i>Study Time</i>
3 March, 2016 Thursday	07.30-08.30	<i>Breakfast</i>		
	08.15	<i>Transfer to Protaras with luggage</i>		
	09.30-10.30	<i>Jury Meeting, Room Queen ELENA (Mezzanine)</i>		<i>Jury Meeting</i>
	11.00-14.30	<i>Check-in at Constantinos the Great hotel and Review Time</i>		<i>Review Time</i>
	14.30-15.30	<i>Lunch at hotel</i>		
	15.30-18.00	<i>Free Time, Exam papers are copied</i>		
	18.00-19.00	<i>Papers distributed to leaders for marking</i>		<i>Free Time</i>
	19.00-21.00	<i>Dinner at hotel</i>		
	21.00-24.00	<i>Marking Activity by Leaders and Deputy Leaders</i> <i>Room Queen ELENA (Mezzanine)</i>		<i>Free Time</i>
4 March, 2016 Friday	07.30-09.00	<i>Breakfast</i>		
	08.30-13.00	<i>Grading Coordination Meetings</i> <i>Conference room ANASTASIA (Level -1)</i>		<i>Social Event</i>
	13.00-14.00	<i>Lunch</i>		
	14.00-19.00	<i>Grading Coordination Meetings</i> <i>Conference room ANASTASIA (Level -1)</i>		
	19.00-20.30	<i>Dinner at hotel</i>		
	20.30-24.00	<i>Jury Meeting to finalize results</i> <i>Room Queen ELENA (Mezzanine)</i>		<i>Free Time</i>

5 March, 2016 Saturday	07.30-09.00	<i>Breakfast</i>
	09.30-14.00	<i>Social Activity (suggestions to be announced)</i>
	14.00-15.00	<i>Lunch at hotel</i>
	15.00-18.30	<i>Free Time</i>
	18.30-20.00	<i>Awards Ceremony</i>
	20.00-24.00	<i>Farewell Dinner at "Constantinos the Great Hotel", Emperor Restaurant</i>
6 March, 2016 Sunday	07.30-09.00	<i>Breakfast</i>
	09.00+	<i>Departures</i>

SEEMOUS 2016 BUS SCHEDULE

Emergency call: +357-99641843 Gregory Makrides

DATE	BUS departures	LEADERS/DEPUTY LEADERS+STUDENTS
Tuesday 1 March -From Larnaca airport -From Larnaca airport	At specific times	ARRIVALS at the Larnaca International Airport Transfer to "Constantinos the Great" Hotel, Protaras Transfer to Lordos Hotel , Larnaca Area, (Jury Hotel)
Wednesday 2 March -JURY: from Lordos Hotel, Larnaca area	08.30	Transfer to UCLAN
-From hotel "Constantinos the Great", Protaras	13.00	Visit to Nicosia Archaeological Museum
-From Nicosia Archaeological Museum	15.00	Opening Ceremony at University of Cyprus Campus
-From UCLAN (Jury)	15.00	Opening Ceremony at University of Cyprus
-From University of CY	17.00	Transfer back to the Hotels (stay in the same bus)
-JURY: from Lordos Hotel	20.00	Transfer to UCLAN
-JURY: from UCLAN	(24.00)	Transfer to Lordos Hotel (when final paper is selected and translated)
Thursday 3 March -From Lordos hotel	8.15	Transfer to Constantinos the Great hotel, Protaras (with luggage)
Saturday 6 March From Constantinos the Great Hotel, Protaras	At Specific times	The Larnaca International Airport