The department meeting has been held under the head hip & Si N'VS bagavan on 3rd pecember 2018 and the fallowing active tres are resolved

- i) coverage of Syllabus as per ceniverations.
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Physics Dept.

Boyl Degree College (Men)

SRIKAKULAM

From
Sri Bhagavan, In charge
Department of Physics,
Govt. Degree College for Men,
Srikakulam.

To
The Principal,
Govt. Degree College for Men,
Srikakulam.

Subject: Request to Introduce Certificate Course for UG -B.Sc. Students - Reg. Respected Sir,

The Department of Physics in its meeting held on 03-12-2018 at Department of Physics passed a resolution to request the introduction of a certificate course on Statistical Mechanics for B.Sc. students at Govt. Degree College (Men), Srikakulam. This course will provide valuable additional knowledge, skills, and opportunities, enhancing our student's academic and career prospects. Your consideration of this request is greatly appreciated.

Thanking you Sir,

Jeng

Yours Sincerely,

rela

#### **GOVERNMENT DEGREE COLLEGE (MEN), SRIKAKULAM**

REACCREDITED by NAAC with B++ CGPA (2.90)
Affiliated to Dr.BR. Ambedkar University, Srikakulam

SRIKAKULAM - 532001, ANDHRA PRADESH, INDIA

Ph No : 9948121716 | E-Mail : srikakulam.jkc@gmail.com | Website : www.gcmsklm.ac.in

Dt. 09.12.2018

### Department of Physics Circular

This is to inform you all that Department of Physics is going to conduct Certificate Course on "Statistical Mechanics" from 12-12-2018 for 30 hours during the working days of the college in Physics Lab. The final year degree students who have the interest to join in the course are requested to give your name to Sri N.V.S. Bhagavan, In-charge Dept. of Physics, on or before 11-12-2018.

In-Charge

Dept. of Physics

Principal

Govt Degree College (Men) SRIKAKULAM.

#### **CERTIFICATE COURSE BROCHURE: 2018-19**



#### GOVERNMENT DEGREE COLLEGE (MEN)

ACCREDITED BY NAAC WITH B++ (CGPA 2.90)

Srikakulam - 532001, Andhra Pradesh, India

ph: 08842 222383 e-mail: info@gdsmaklm.ac.in website: https://www.gdcmaklm.ac.in



### Statistical Mechanics Offered by

#### Department of Physics, Govt. Degree College for Men, Srikakulam

**About the Course:** A certificate course in statistical mechanics for B.Sc students would typically cover fundamental concepts and techniques in statistical mechanics, which is a branch of physics and chemistry that uses probability theory to study the behaviour of large collections of particles This course would provide B.Sc students with a solid foundation in statistical mechanics, preparing them for further study or applications in physics, chemistry, materials science, and related fields.

Number of Credits: Nil Mode of Teaching: Offline

Course Contents: The course covers basic probability theory, classical and quantum statistical mechanics, thermodynamics, phase transitions, and advanced topics like fluctuations. It includes applications and hands-on components, preparing students for real-world problem-solving. Assessment is through regular evaluations and possibly a project.

References: 1. "Statistical Mechanics: A Set of Lectures" by Richard P. Feynman.

2. "Statistical Mechanics: A Set of Lectures" by Narayan R. Khusnood.

Eligibility Criteria: B.sc final year Mathematical Science students only. Fee Structure:NIL

#### **Important Dates**

Registration start date : 03.12.2018
Last date for registration : 11.12.2018
Commencement of classes : 12.12.2018
Last class work : 24.01.2019
Date of final examination : 25.01.2019

#### **Paper Code: GCMPHY01**

**Admission Procedure:** Interested participants can complete the registration process through the following registration forms for the above course is available at the department of Physics. Admission process for this course is on first-come-first-serve basis and the last date for registration to the courses 11.12.2018.

Class Duration: Classes will be held for 30hours starting from 12.12.2018. Every week classes will be held on Monday to Friday (except for the national holidays/festivals). Final examination will be conducted on 25.01.2019. The class timings will be 4.30–5.30 hours IST (except for the day of the final examination).

**Assessment:** Assessment will be based on completion of assignments and performance in the test conducted at the end of the course. The participant must obtain at least 50% in the test to avail the course completion certificate.

#### **Course Coordinator**

Sri Kuna Srinivasa rao, Lecturer in Physics, Department of Physics

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# GOVT. DEGREE COLLEGE(MEN), SRIKAKULAM DEPT. OF PHYSICS CERTIFICATE COURSE STATASTICAL MECHANICS

Duration: 30 Hrs Year: 2018-19

### **SYLLABUS**

#### **Introduction to Thermodynamics**

8 Hrs

Basic concepts of thermodynamics (laws of thermodynamics, internal energy, work, heat, entropy), Thermodynamic potentials (Helmholtz free energy, Gibbs free energy) and their significance

### **Microscopic Basis of Thermodynamics**

7 Hrs

Kinetic theory of gases (Maxwell-Boltzmann distribution, equipartition theorem), Statistical interpretation of entropy, Boltzmann factor, Boltzmann distribution

#### **Classical Statistical Mechanics**

8 Hrs

Ensemble theory (microcanonical, canonical, grand canonical ensembles), Applications of classical statistical mechanics (ideal gas, fluctuations, phase transitions)

#### **Quantum Statistical Mechanics**

7 Hrs

Quantum statistical ensembles (Fermi-Dirac, Bose-Einstein distributions), Applications of quantum statistical mechanics (blackbody radiation, Bose-Einstein condensation)

### MODEL PAPER FOR CERTIFICATE COURSE

#### **DEPARTMENT OF PHYSICS**

### **COURSE CODE:** GDCMPHY01

### (CROSS CUTTING ISSUES IN NUCLEAR ENERGY)

(CROSS CUTTING ISSUES IN NUCLEAR ENERGY)					
MAX.MARKS:75		TIME: 03HOURS			
	<u>SECTION-I</u>				
	Answer all questions	5x1=5 Marks			
	( Multiple Choice Questions )	0.11 0 1.111111			
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	<u>SECTION–II</u>				
	Answer any of the four questions.	4x5=20 Marks			
	(Short Answer Questions)				
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	<u>SECTION-III</u>				
	Answer any of the three questions.	3x10=30 Marks			
	(Long Answer Questions)	3X10–30 Walks			
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14.					
	SECTION-IV				
	Answer any of the three questions.	3x5=15 Marks			
	(Problem-Solving Questions)				
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#### GOVT.DEGREE COLLEGE (MEN)-SRIKAKULAM CERTIFICATE COURSE EXAM PAPER

(Statistical Mechanics)

MAX.MARKS:75 TIME: 3Hrs

#### SECTION-I

Answer all questions (Multiple Choice Questions)

5x1=5 Marks

- 1. Which of the following laws of thermodynamics states that the entropy of a system tends to increase over time?
- a) Zeroth law
- b) First law
- c) Second law
- d) Third law
- 2. The Helmholtz free energy is defined as:
- a) F = U TS
- b) F = U + TS
- c) F = H TS
- d) F = H + TS
- 3. The Maxwell-Boltzmann distribution describes the:
- a) Distribution of velocities of particles in an ideal gas.
- b) Distribution of energies of particles in an ideal gas.
- c) Distribution of positions of particles in an ideal gas.
- d) Distribution of masses of particles in an ideal gas.
- 4. Which ensemble is associated with constant volume, energy, and number of particles?
- a) Microcanonical ensemble
- b) Canonical ensemble
- c) Grand canonical ensemble
- d) Isothermal ensemble
- 5. The Fermi-Dirac distribution describes the distribution of:
- a) Photons
- b) Electrons
- c) Bosons
- d) Neutrons

#### **SECTION-II**

Answer any of the four questions.

(Short Answer Questions)

4x5=20 Marks

- 6. Define entropy and explain its significance in thermodynamics.
- 7. State and explain the third law of thermodynamics.
- 8. Derive the expression for the Gibbs free energy.
- 9. Explain the concept of equipartition theorem.
- 10. Discuss the conditions for the phase transition in a system.

#### **SECTION-III**

Answer any of the three questions.
(Long Answer Questions)

3x10=30 Marks

- 11. Discuss the postulates of the kinetic theory of gases. Derive the Maxwell-Boltzmann distribution.
- 12. Explain the micro canonical ensemble and derive the expression for entropy in terms of the micro canonical ensemble.
- 13. Describe the Fermi-Dirac distribution and its significance in quantum statistical mechanics.
- 14. Discuss the concept of phase transitions in detail, including the types of phase transitions and the role of statistical mechanics in their understanding.

#### SECTION-IV

Answer any of the three questions. (Problem-Solving Questions)

3x5=15 Marks

- 15. A system undergoes an isothermal process at 300 K. If the change in Helmholtz free energy is -500 J, calculate the change in entropy.
- 16. Consider an ideal gas consisting of N particles. If the particles are distributed among energy levels according to the Maxwell-Boltzmann distribution, derive the expression for the average energy of a particle.
- 17. A system undergoes a phase transition from liquid to gas at constant temperature and pressure. Discuss the changes in entropy and Gibbs free energy during this process.
- 18. Calculate the Fermi energy for a system of electrons at absolute zero temperature with a density of states proportional to the square root of energy.
- 19. Using the canonical ensemble, derive the expression for the partition function of a system consisting of N non-interacting particles.

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### $\underline{GovernmentDegreeCollege(M),Srikakulam}$



### ConsolidatedFeedback

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No.of participants from whom feed back is collected= 5D

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Coordinator



## $\underline{GovernmentDegreeCollege(M).Srikakulam}$



### Feedback

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### $\underline{Government Degree College(M), Srikakulam}$



### Feedback

Name of the Certificate Course	Statistical Mechanics
Department	Physics
Date	10.01.2019
Name of the participant	G. Malesh
Group	MPC

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Signatureofthel'articipant



## GovernmentDegreeCollege(M),Srikakulam



### Feedback

Name of the Certificate Course	Statistical Mechanics
Department	Physics
Date	10.01.2019
Name of the participant	G. Usha
Group	M.P.Cs

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## GovernmentDegreeCollege(M),Srikakulam



### Feedback

Name of the Certificate Course	Statistical Mechanics
Department	Physics
Date	10.01.2019
Name of the participant	A. SHANKAR
Group	M.P.Cs

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## GovernmentDegreeCollege(M),Srikakulam



### Feedback

Name of the Certificate Course	Statistical Mechanics
Department	Physics
Date	10.01.2019
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Srikakulam, Andhra Pradesh, India-532001

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(Affiliated to Dr.BRAU, Srikakulam)

## Certificate Course on STATISTICAL MECHANICS

This is to certify that Kum./Mr. A PRUDHVI RAJ, III B.Sc. (MPC), Govt. Degree College (Men), Srikakulam got registered himself/herself for the Certificate Course on STATISTICAL MECHANICS, organized by the Department of Physics and completed the course programme during from 12-12-2018 to 10-01-2019. Her/His performance is credited with "A" Grade.

Sri K. Srinivasa Rao

**Course Coordinator** 

Sri N.V.S. Bhagavan

Incharge Dept. of Physics

Jens

Dr. M. Babu Rao





Srikakulam, Andhra Pradesh, India-532001

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Sri K. Srinivasa Rao

**Course Coordinator** 

Sri N.V.S. Bhagavan

**Incharge Dept. of Physics** 

Jein

Dr. M. Babu Rao





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Sri K. Srinivasa Rao

**Course Coordinator** 

Sri N.V.S. Bhagavan

**Incharge Dept. of Physics** 

Jens

Dr. M. Babu Rao





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Sri K. Srinivasa Rao

**Course Coordinator** 

Sri N.V.S. Bhagavan

**Incharge Dept. of Physics** 

Jein

Dr. M. Babu Rao





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Sri K. Srinivasa Rao

**Course Coordinator** 

Sri N.V.S. Bhagavan

**Incharge Dept. of Physics** 

Jens

Dr. M. Babu Rao





Srikakulam, Andhra Pradesh, India-532001

(Accredited by NAAC B++ (CGPA:2.90))
(Affiliated to Dr.BRAU, Srikakulam)

## Certificate Course on STATISTICAL MECHANICS

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Sri K. Srinivasa Rao

**Course Coordinator** 

Sri N.V.S. Bhagavan

**Incharge Dept. of Physics** 

Oleup

Dr. M. Babu Rao





Srikakulam, Andhra Pradesh, India-532001

(Accredited by NAAC B++ (CGPA:2.90))
(Affiliated to Dr.BRAU, Srikakulam)

## Certificate Course on STATISTICAL MECHANICS

This is to certify that Kum./Mr. **G PRASANNA KUMAR**, **III B.Sc. (MPC)**, **Govt. Degree College (Men)**, **Srikakulam** got registered himself/herself for the Certificate Course on STATISTICAL MECHANICS, organized by the **Department of Physics** and completed the course programme during from **12-12-2018 to 10-01-2019**. Her/His performance is credited with "A" Grade.

Sri K. Srinivasa Rao

**Course Coordinator** 

Sri N.V.S. Bhagavan

**Incharge Dept. of Physics** 

Jeens

Dr. M. Babu Rao





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## Certificate Course on STATISTICAL MECHANICS

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This is to certify that Kum./Mr. R KALIDASU, III B.Sc. (MPE), Govt. Degree College (Men), Srikakulam got registered himself/herself for the Certificate Course on STATISTICAL MECHANICS, organized by the Department of Physics and completed the course programme during from 12-12-2018 to 10-01-2019. Her/His performance is credited with "A" Grade.

Sri K. Srinivasa Rao

**Course Coordinator** 

Sri N.V.S. Bhagavan

**Incharge Dept. of Physics** 

Jens

Dr. M. Babu Rao





Srikakulam, Andhra Pradesh, India-532001

(Accredited by NAAC B++ (CGPA:2.90))
(Affiliated to Dr.BRAU, Srikakulam)

# Certificate Course on STATISTICAL MECHANICS

This is to certify that Kum./Mr. S SIVA PRASAD, III B.Sc. (MPE), Govt. Degree College (Men), Srikakulam got registered himself/herself for the Certificate Course on STATISTICAL MECHANICS, organized by the Department of Physics and completed the course programme during from 12-12-2018 to 10-01-2019. Her/His performance is credited with "A" Grade.

Sri K. Srinivasa Rao

**Course Coordinator** 

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# Certificate Course on STATISTICAL MECHANICS

This is to certify that Kum./Mr. **S SUDHEER**, **III B.Sc.** (MPE), **Govt. Degree College** (Men), **Srikakulam** got registered himself/herself for the Certificate Course on STATISTICAL MECHANICS, organized by the **Department of Physics** and completed the course programme during from **12-12-2018** to **10-01-2019**. Her/His performance is credited with "A" Grade.

Sri K. Srinivasa Rao

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This is to certify that Kum./Mr. S ASHA, III B.Sc. (MPE), Govt. Degree College (Men), Srikakulam got registered himself/herself for the Certificate Course on STATISTICAL MECHANICS, organized by the Department of Physics and completed the course programme during from 12-12-2018 to 10-01-2019. Her/His performance is credited with "A" Grade.

Sri K. Srinivasa Rao

**Course Coordinator** 

Sri N.V.S. Bhagavan

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### Certificate Course on STATISTICAL MECHANICS

This is to certify that Kum./Mr. **S SAI**, **III B.Sc.** (MPE), **Govt. Degree College** (Men), **Srikakulam** got registered himself/herself for the Certificate Course on STATISTICAL MECHANICS, organized by the **Department of Physics** and completed the course programme during from **12-12-2018 to 10-01-2019**. Her/His performance is credited with "A" Grade.

Sri K. Srinivasa Rao

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# Certificate Course on STATISTICAL MECHANICS

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Sri K. Srinivasa Rao

**Course Coordinator** 

Sri N.V.S. Bhagavan

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Dr. M. Babu Rao



