Central University of Himachal Pradesh

Department of Physics and Astronomical Science
School of Physical and Material Sciences

Minutes of the 13th meeting of the Board of Studies of Department of Physics and Astronomical Science

Date and Time: 15th December 2022 at 2:00 PM
Venue: Shahpur Parisar, CUHP.

The meeting of the 13th Board of Studies (BOS) of Department of Physics and Astronomical Science (DPAS) held on 13th December 2022 at 2:00 PM at Shahpur Parisar, CUHP.
Following members attended the meeting:

1. **Prof. Rajesh Kumar**
   Chairman, BOS
   Head
   Department of Physics and Astronomical Science, CUHP

2. **Prof. Hum Chand**
   Dean
   School of Physical and Material Science, CUHP

3. **Prof. B. C. Chauhan**
   Member
   Department of Physics and Astronomical Science, CUHP

4. **Prof. Raman Sharma**
   External member
   Department of Physics, HPU Shimla

5. **Dr. Vimal Sharma**
   External member
   NIT Hamirpur

6. **Dr. Mahesh Kulharia**
   Member
   Director, Centre for Computational Biology and Bioinformatics, CUHP

7. **Dr. Rajender Kumar**
   Member
   Department of Chemistry and Chemical Science, CUHP

8. **Dr. Dalip Singh Verma**
   Member
   Associate Professor, Department of Physics and Astronomical Science, CUHP

The Chairman, Prof. Rajesh Kumar, welcomed and thanked the BOS members for sparing their valuable time for the meeting. He briefed the members about the activities and progress made by the department since last meeting and outlined the plan of the meeting. Thereafter, agenda items were taken up, sequentially, to place before the BOS members. The members held comprehensive deliberations on all the agenda items and following decisions were unanimously taken:

Item PAS-BOS-13.1:
The BOS, unanimously, confirmed the minutes of the 12th BOS meeting held on 24-09-2021 at Shahpur Parisar (Online Mode) **(Annexure-12th BOS)**.

Item PAS-BOS-13.2:
The BOS approved the list of courses for M. Sc. Programme under NEP2020 for the session 2021-23 **(Annexure-I)**.

Item PAS-BOS-13.3:
The BOS approved the list of courses for M. Sc. Programme under NEP2020 for the session 2022 onwards **(Annexure-II)**.

Item PAS-BOS-13.4:
The BOS approved the list of courses (Vocational/Skill/IDC/Elective Specialization) for M. Sc. Programme under NEP2020 for the session 2022 onwards **(Annexure-III)**.

Item PAS-BOS-13.5:
The BOS approved the list of courses for B. Sc. Programme under NEP2020 up to third semester **(Annexure-IV)**.

Item PAS-BOS-13.6:
The BOS approved the revised Research Degree (RD) programme course structure in concurrence with NEP 2020 **(Annexure-V)**.

Item PAS-BOS-13.7:
The BOS approved the change of Ph. D. supervisor/Co-supervisor and Synopsis of Ph. D. students:

S. No.	Name Roll No	Earlier Supervisor/ Co-supervisor	New Supervisor/ Co-supervisor	Title
1.	Aditi Sharma CUHP17RDPHY01	**Supervisor-** Prof. OSKS Sastri **Co-Supervisors-** Dr. Padmnabh Rai Dr. Ambuj Tripathi	**Supervisor-** Prof. OSKS Sastri	**Old-** Indigenous design & development of Nuclear particle detector using crystal diamonds **New-** Physics Education Research Based Simulation Activities for Solving Quantum Mechanical Problems
2.	Shivani Kalia CUHP15RDPHY03	**Supervisor-** Dr. Rajesh Kumar Singh, **Co-Supervisor-** Dr. Rajnish Dhiman	**No change**	**Old-** Light Detection by Graphene and Carbon Nanotube Field Effect Transistors **New-** Two-dimensional nanomaterial composites with metal/metal oxide nanoparticles for integrated applications

Item PAS-BOS-13.8: The BOS approved the proposed certificate courses **(Annexure-VI)**.

Item PAS-BOS-13.9: The BOS ratified the minutes of the first RDC meeting **(Annexure-VII)**.

Item PAS-BOS-13.10: The BOS approved the revisions in syllabi of the following courses:

S. No.	Programme	Course Name and Code	Remarks
1.	M. Sc. Physics	Quantum Field Theory, PAS9106A (effective from July 2022)	**Annexure VIII**
2.	M. Sc. Physics	Quantum Mechanics, PAS8104 (effective from July 2022)	

Item PAS-BOS-13.11:
The BOS approved the guidelines and course contents of Community connect course **(Annexure IX)**.

Item PAS-BOS-13.12:
The BOS approved the following list of examiners:

S. No.	Name of the Examiner	Institute
1.	Prof. Anand Narayanan	IIST, Trivendram
2.	Prof. Biman Mahdi	Guwahati University
3.	Dr. Ravi Joshi	IIA, Bangalore
4.	Dr. Vivek M.	IIA, Bangalore
5.	Dr. Lakshmi Kant Chaware	Raipur University
6.	Prof. Shantnu Rastogi	Gorakhpur University
7.	Prof. Ramesh	Kumaun University
8.	Dr. Amitesh Omar	IIT Kanpur
9.	Prof. Somnath Bhardwaj	IIT Kharagpur
10.	Prof. Jasjeet Bagla	IISER Mohali
11.	Dr. Harvinder Kaur	IISER Mohali
12.	Dr. Pankaj Kumar	IISER Mohali
13.	Prof. Vir Singh Rangra	HPU Shimla
14.	Prof. Manish Kumar	JNU, New Delhi
15.	Dr. Kuldeep Sharma	NIT Hamirpur
16.	Prof. R. K. Moudgil	Kurukshetra University
17.	Prof. Ram Nath Jha	JNU, New Delhi
18.	Dr. Suram Singh	CU Jammu
19.	Dr. Nirmalya Kajuri	IIT Mandi
20.	Prof. Rajnikant	University of Jammu
21.	Prof. K. B. Joshi	MLS University Udaipur
22.	Dr. Raj Kumar	HPU Shimla
23.	Dr. Balbir Singh Patial	HPU Shimla
24.	Prof. Narinder Singh	PRL Ahmedabad
25.	Dr. Akshay Kumar	SPU Mandi
26.	Dr. Arvind Kumar	NIT Hamirpur

The meeting ended with vote thanks to all the board members by the Chairman.

Signatures:

1. **Prof. Rajesh Kumar**
   Chairman, BOS
   Head
   Department of Physics and Astronomical Science, CUHP

2. **Prof. Hum Chand**
   Dean
   School of Physical and Material Science, CUHP

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Central University of Himachal Pradesh

Department of Physics and Astronomical Science
School of Physical and Material Sciences

Agenda of 13th Board of Studies Meeting

Date and Time: 15th December, 2022, 2:00PM.
Venue: Seminar Hall, Shahpur Parisar.

- **PAS-BOS-13.1:** To confirm the minutes of the 12th BOS meeting held on 24-09-2021 at Shahpur Parisar (Online Mode) **(Annexure-12th BOS).**

- **PAS-BOS-13.2:** To approve the list of courses for M. Sc. Programme under NEP2020 for the session 2021-23 **(Annexure-I).**

- **PAS-BOS-13.3:** To approve the list of courses for M. Sc. Programme under NEP2020 for the session 2022 onwards **(Annexure-II).**

- **PAS-BOS-13.4:** To approve the list of courses (Vocational/Skill/IDC/Elective Specialization) for M. Sc. Programme under NEP2020 for the session 2022 onwards **(Annexure-III).**

- **PAS-BOS-13.5:** To approve the list of courses for B. Sc. Programme under NEP2020 up to third semester **(Annexure-IV).**

- **PAS-BOS-13.6:** To approve the revised Research Degree (RD) programme course structure in concurrence with NEP2020 **(Annexure-V).**

- **PAS-BOS-13.7:** To approve the change of Ph. D. supervisor/co-supervisor and Synopsis of Ph. D. students:

S. No.	Name and Roll No	Earlier Supervisor/ Co-Supervisor	New Supervisor/ Co-Supervisor	Title
	Aditi Sharma CUHP17RDPHY01	**Supervisor-** Prof. OSKS Sastri **Co-Supervisors-** Dr. Padmnabh Rai Dr. Ambuj Tripathi	**Supervisor-** Prof. OSKS Sastri	**Old-** Indigenous design & development of Nuclear particle detector using crystal diamonds **New-** Physics Education Research Based Simulation Activities for Solving Quantum Mechanical Problems
	Shivani Kalia CUHP15RDPHY03	**Supervisor-** Dr. Rajesh Kumar Singh, **Co-Supervisor-** Dr. Rajnish Dhiman	**No change**	**Old-** Light Detection by Graphene and Carbon Nanotube Field Effect Transistors **New-** Two-dimensional nanomaterial composites with metal/metal oxide nanoparticles for integrated applications

- **PAS-BOS-13.8**: To approve certificate courses **(Annexure-VI)**.

- **PAS-BOS-13.9**: To ratify the minutes of the RDC **(Annexure-VII)**.

- **PAS-BOS-13.10**: To approve the revision in syllabi of the following courses:

S. No.	Programme	Course Name and Code	Remarks
1.	M. Sc. Physics	Quantum Field Theory, PAS9106A (effective from July 2022)	**Annexure VIII**
2.	M. Sc. Physics	Quantum Mechanics, PAS8104 (effective from July 2022)	

- **PAS-BOS-13.11**: To approve the guidelines and course contents of Community connect course **(Annexure IX)**.

- **PAS-BOS-13.12**: To approve the following list of examiners.

S. No.	Name of the Examiner	Institute
1.	Prof. Anand Narayanan	IIST, Trivendram
2.	Prof. Biman Mahdi	Guwahati University
3.	Dr. Ravi Joshi	IIA, Bangalore
4.	Dr. Vivek M.	IIA, Bangalore
5.	Dr. Lakshmi Kant Chaware	Raipur University
6.	Prof. Shantnu Rastogi	Gorakhpur University
7.	Prof. Ramesh	Kumaun University
8.	Dr. Amitesh Omar	IIT Kanpur
9.	Prof. Somnath Bhardwaj	IIT Kharagpur
10.	Prof. Jasjeet Bagla	IISER Mohali
11.	Dr. Harvinder Kaur	IISER Mohali
12.	Dr. Pankaj Kumar	IISER Mohali
13.	Prof. Vir Singh Rangra	HPU Shimla
14.	Prof. Manish Kumar	JNU, New Delhi
15.	Dr. Kuldeep Sharma,	NIT Hamirpur
16.	Prof. R. K. Moudgil	Kurukshetra University
17.	Prof. Ram Nath Jha	JNU, New Delhi
18.	Dr. Suram Singh	CU Jammu
19.	Dr. Nirmalya Kajuri	IIT Mandi

- **Any other agenda item with the permission of the Chair.**

Prof. Rajesh Kumar
Head
Department of Physics and Astronomical Science

Annexure-I, Course structure for the 2021-23 Batch

M. Sc. Physics

I-Semester

S. No.	Name of the Course	CourseCode	Course Type	Course Credit
1	Classical Mechanics	PAS8101	Major	4
2	Classical Electrodynamics	PAS8102	Major	4
3	IDC		Major	2
4	Quantum Mechanics	PAS8104	Minor	4
5	General Physics LabSkills	PAS8105L	V/S	2
6	Python Programming in Astrophysical Science	PAS8106L	V/S	2
7	Indian Knowledge System	PAS8107	IKS	2
	Total			**20**
	IDC Courses offered by the Department			
1	Mathematical Physics	PAS8103	IDC Major	2
2	Waves and Optics	PAS8111	IDC Major	2

II-Semester

1	Statistical Mechanics	PAS8201	Major	4
2	Advanced Quantum Mechanics	PAS8202	Major	4
3	Condensed Matter Physics	PAS8203	Major	4
4	Astronomy and Astrophysics	PAS8204	Minor	2
5	Observational Skills in Astronomy	PAS8206L	V/S	2
6	Bhartiya Astronomy and Kal Ganana	PAS8207	IKS	2
7	IDC		Minor	2
	Total			**20**
	IDC Courses offered by the Department			
1	Scientific Writing and Presentation Skills	PAS8208L	IDC Minor	2
2	Nanomaterials	PAS8209	IDC Minor	2

III-Semester

1	Nuclear and ParticlePhysics	PAS9101	Major	4

2	Atomic, Molecular and Laser Physics	PAS9102	Minor	4
3	Numerical Methods for Research	PAS9103L	V/S	2
4	Modern Physics Lab	PAS9104L	V/S	2
5*	Elective Specialization-I		RLRP	4
6	Review of Literature and Research Proposal	PAS9106	RLRP	4
	Total			**20**
***Elective Specialization-I (Choose any One)**				
1	Quantum Field Theory	PAS9105A	RLRP	4
2	Advanced Condensed Matter Physics-I	PAS9105B	RLRP	4
3	Theoretical NuclearPhysics-I	PAS9105C	RLRP	4
IV Semester				
1	Elective Specialization-II	ANNEXURE-III	Major	4
2	Scientific Writing and Publication	PAS9202	Minor	2
3	Paper Publication Seminar Conference presentation	PAS9203	Minor	2
4	Software Based Data Analysis	PAS9204	V/S	2
5	Electronic Instrumentation	PAS9205	V/S	2
6	Project	PAS9206	Dissertation and Presentation	8
	Total			**20**

M. Sc. Physics

I-Semester

S. No.	Name of the Course	CourseCode	Course Type	Course Credit
1	Classical Mechanics	PAS8101	Major	4
2	Quantum Mechanics	PAS8104	Major	4
3	IDC Course		Major	2
4	Classical Electrodynamics	PAS8102	Minor	4
5	General Physics LabSkills	PAS8105L	V/S	2
6	Semiconductor Devices	PAS8108	V/S	2
7	Indian Knowledge System	PAS8107	IKS	2
	Total			**20**
IDC Courses offered by the Department				
1	Mathematical Physics	PAS8103	IDC Major	2
2	Waves and Optics	PAS8111	IDC Major	2

II-Semester

1	Statistical Mechanics	PAS8201	Major	4
2	Advanced Quantum Mechanics	PAS8202A	Major	2
3	Condensed Matter Physics	PAS8203	Minor	4
4	Astronomy and Astrophysics	PAS8204	Major	2
5	Mathematical Physics	PAS8205	Major	2
5	Observational Skills in Astronomy	PAS8206L	V/S	2
6	Bhartiya Astronomy and Kal Ganana	PAS8207	IKS	2
7	IDC		Major	2
	Total			**20**
IDC Courses offered by the Department				
1	Scientific Writing and Presentation Skills	PAS8208	IDC Major	2
2	Nanomaterials	PAS8209	IDC Major	2

III-Semester

1	Nuclear and ParticlePhysics	PAS9101	Major	4

2	Atomic, Molecular andLaser Physics	PAS9102	Minor	4
3	Numerical Methods for Research	PAS9103L	V/S	2
4	Modern Physics Lab	PAS9104L	V/S	2
5*	Elective Specialization-I		RLRP	4
6	Review of Literature and Research Proposal	PAS9106	RLRP	4
	Total			**20**
***Elective Specialization-I (Choose any One)**				
1	Quantum Field Theory	PAS9106A	RLRP	4
2	Advanced Condensed Matter Physics-I	PAS9106B	RLRP	4
3	Theoretical NuclearPhysics-I	PAS9106C	RLRP	4
IV Semester				
1	Elective Specialization-II	ANNEXURE-III	Major	4
2	Scientific Writing and Publication	PAS9202	Minor	2
3	Paper Publication Seminar/Conference presentation	PAS9203	Minor	2
4	Software Based Data Analysis	PAS9204	V/S	2
5	Electronic Instrumentation	PAS9205	V/S	2
6	Project	PAS9206	Dissertation and Presentation	8
	Total			**20**

Note: The Course codes may be changed as per future guidelines from CUHP/UGC.

Annexure-III, M. Sc. Physics

List of Vocational/Skill, IKS, IDC Courses and Elective Specialization Courses

S. No.	Vocational/Skill Courses (2 Credits)	
1.	Semiconductor Devices	PAS8108
2.	General Physics Lab Skills	PAS8105L
3.	Python Programming in Astrophysical Science	PAS8106L
4.	Observational Skills in Astronomy	PAS8206L
5.	Numerical Methods for Research	PAS9103L
6.	Modern Physics Lab	PAS9104L
7.	Software Based Data Analysis	PAS9204
8.	Electronic Instrumentation	PAS9205
9.	Numerical methods and Data Analysis	
10.	Computation Physics	
11.	Physics Workshop Skills	
12.	Electrical circuits and Network Skills	
13.	Basic Instrumentation Skills	
14.	Renewable Energy and Energy harvesting	
15.	Technical Drawing	
16.	Radiation Safety	
17.	Applied Optics	
18.	Weather Forecasting	
19.	IT Skills	
20.	Scientific Writing and Presentation	
21.	Data Analysis Techniques	
22.	Internet of Things	
23.	Sensors and Automation	
24.	Quantum Computing	
25.	Experimental Techniques	
26.	Programming Lab	
27.	Simulation Lab	
28.	Semiconductor Devices Lab	
29.	Computational Physics Lab	
30.	Advanced Data Analysis - I	
31.	Advanced Data Analysis - II	
Note: The course codes shall be assigned later when the course is offered.		
	Courses Based on Indian Knowledge System (IKS) (2 Credits)	
1.	Indian Knowledge System	PAS8107
2.	Bhartiya Astronomy and Kal Ganana	PAS8207
	IDC Courses offered by the Department (2 Credits)	
1.	Mathematical Physics	PAS8103
2.	Waves and Optics	PAS8111
3.	Scientific Writing and Presentation Skills	PAS8208
4.	Nano Materials	PAS8209
	Elective Specialization (ES) (4 Credits)	
1.	Quantum Field Theory	PAS9106A
2.	Advanced Condensed Matter Physics-I	PAS9106B
3.	Theoretical Nuclear Physics-I	PAS9106C
4.	High Energy Physics	PAS9201A
5.	Material Characterization	PAS9201B
6.	Physics of Nano Materials	PAS9201C
7.	Plasma Physics	PAS9201D
8.	Gravitation and Cosmology	PAS9201E
9.	Physics Education Research	PAS9201F
10.	Advanced Astronomy & Astrophysics	PAS9201G
11.	Elementary Particles and Interactions	PAS9201H
12.	Theory of Nuclear Reactions	PAS9201K

B. Sc. (Honours) Physics

I-Semester

S. No.	Name of the Course	CourseCode	Course Type	Course Credit
1	Mechanics	PAS5101	Major	4
2	Mathematical Physics-I	PAS5102	Major	4
3	Organic Stereochemistry and Spectroscopy	CCS5101	IDC Minor	4
4	Lab Skills in Chemical Sciences-I	CCS5101L	Lab/Field	2
5	Mechanics Lab Skills	PAS5105L	V/S	2
6	Indian KnowledgeSystem	PAS5106	IKS	4
	Total			**20**
	IDC Courses offered by the Department			
1	Nanomaterials	PAS5111	IDC Minor	2
2	Heat and Thermodynamics	PAS5112	IDC Minor	2

II-Semester

1	Electricity and Magnetism	PAS5201	Major	4
2	Mathematical Physics-II	PAS5202	Major	4
3	Electrochemistry	CCS5201	IDC Minor	4
4	Lab Skills in Chemical Sciences-II	CCS5201L	Lab	2
5	Nuclear Radiation and Safety	PAS5203	V/S	2
6	Electrical Circuits and Network Skills	PAS5204	V/S	2
7	Sanskrit Sambhashna	SKT201	Indian Language	2
	Total			**20**
	IDC Courses offered by the Department			
1	Waves and Optics	PAS5113	IDC Minor	2
2	Heat and Thermodynamics	PAS5112	IDC Minor	2

III-Semester

1	Thermal and Statistical Physics	PAS6101	Major	4
2	Solid State Physics	PAS6102	Major	4
3	Linear Algebra and Tensors	MTH351	IDC Minor	4

4	Linear Algebra and Tensors Tutorial	MTH351T	Lab/Field	2
5	Digital Systems and Applications	PAS6104L	V/S	2
6	Community Connect	PAS6105	Community Connect	4
IDC Courses offered by the Department				
1	Numerical Methods	PAS6110	IDC Minor	2
2	A Course on Scientific Programming using FORTRAN	PAS6112	IDC Minor	2
IV Semester				
1				
2				
3				
4				
5				
6				
7				

Annexure-V

Course structure for RD Programme

Sr. No.	Name of the Course	Course Code	Credit
1.	Research Methodology	PAS1001	04
2.	Research and Publication Ethics	PAS 1002	02
3.	Indian Traditional Knowledge and Practices	PAS1003	02
4.	Pedagogy of Teaching-Learning Process	PTR-622	02
5.	Advanced Computational Methods in Physics	PAS 1005	02
6.	Advanced Computational Methods in Physics Lab	PAS1005L	02
7.	**One course from a Basket of courses offered:**		4
	New insights in the Standard Model of Quantum Physics in Clifford Algebra	PAS1011	
	Stochastic Electrodynamics approach to Quantum physics using Complex Geometric Algebra	PAS1020	
	Black hole Physics	PAS1014	
	Quantum Transport at Mesoscopic Physics	PAS1017	
	Characterization of Materials	PAS1019	
	Statistical Models For Nuclear Decay	PAS1015	
	Neutrino Physics	PAS1010	
	Elementary Particles Standard model and beyond	PAS 1012	
	Plasma Physics and its Applications	PAS1018	
	Advanced Astronomy and Astrophysics	PAS1013	
	Total Credits		**18**

Annexure-VI

Proposal-1

Course Name: Certificate course in "Physics of Electrical Circuits and Electronic Devices"

Course Credits: 20

S. No.	**Name of course**	**Credits**	**Mode**
1	Basics of electrical circuits and components	04	Theory and Hands-on
2	Fundamentals of solid-state devices	04	Theory and Hands-on
3	Elementary digital electronics	04	Theory and Hands-on
4	Fundamentals of computers and digital devices	04	Theory and Hands-on
5	Project	04	Practical
	Total credits		**20**

Course Contents

Course Name: Basics of electrical circuits and components[DPASCC-01]

Credits Equivalent:04 credits

Course Objectives: This course is designed to enable the students to understand the basics analysis of the electrical and electronic circuits with special focus on their application in real life appliances and gadgets.The hands-on/skill portion of this course will focus on familiarizing the students with various circuit components and designing basic circuits. Usage of multimeter and diagnosis of various circuit faults using multimeter. This course will also provide students an exposure to design simple electronic circuits.

Contact Hours: 04 Hours per week

Basic Electricity Principles

Basics of electrical charges, potential, potential difference, electrical current. Ideal voltage and current sources; Electrical resistance: Ohm's law, power dissipation in resistance. AC and DC electricity, frequency, amplitude, average and room mean square (RMS) values. Familiarization with a multimeter, voltmeter and ammeter. Combination of resistances in series and parallel. Applications of resistances and their combination in day-to-day appliances and hands-on demonstrations. Capacitance: The current-voltage relationship for capacitance, energy storage in capacitance, capacitances in series and parallel. Applications of capacitors in day-to-day appliances and hands-on demonstrations. Inductance: The current-voltage relationship for inductance, Energy storage in inductance, Inductances in series and parallel. Applications of inductances in day-to-day appliances and hands-on demonstrations. Inductively coupled circuits, Mutual inductance, the coefficient of coupling; Active and passive circuit components.

(8 Lectures)

Concepts of Circuit Analysis

Voltage and current dividers and their applications in real life appliances; Mesh analysis; Superposition and reciprocity theorems; Thevenin's theorem and its applications; Norton's Theorem and its applications; Network transformations: Thevenin-Norton transformations and their advantages, Star-delta transformation; Nodal analysis and Comparison of mesh and nodal analysis; Analysis of networks

containing dependent sources.

(8 Lectures)

UnderstandingElectricalCircuits

Mainelectriccircuitelementsandtheircombination. Rules to analyze DC sourced electrical circuits. Current and voltage dropacross the DC circuit elements. Single-phase and three-phase AC sources. Comparison of single and three phase appliances.Rules to analyze AC sourced electrical circuits. Real, imaginary and complex powercomponentsof AC source. Powerfactor. Savingelectrical energyin day-to-day applications.

(8Lectures)

Transformers and Rectifiers

DC Power sources, Inductance, capacitance, and impedance. Operation of transformers. Average power, Reactive power and apparent power; Power factor; Complex power; Ideal transformer; Single/three phase power transformers; Transformer tests; Voltage regulation conditions for maximum efficiency; Maximum power transfer. Rectifiers and their applications: full wave and half wave. Filter circuits and their applications. Basic working and applications of switched-mode-power-supply (SMPS).

(8 Lectures)

Electric GeneratorsandMotors

Lorentz force and effect of magnetic field on electric charges. Design and working of electric generator. Force on current carrying conductor and its application in designing electrical motors. Application of Single-phase, three-phase & DC motors. Basic design. Interfacing DCorACsourcestocontrolheaters &motors.Speed&power of AC motor.

(8 Lectures)

Hands-on/skills **(10 Hours)**

Exp. 1. Using multimeter for measuring resistance, voltage, capacitor and current

Exp. 2 Examine the use of Thévenin's Theorem to create simpler versions of DC circuits as an aide to analysis.

Exp. 3. Construct an electric circuit with passive components and verify Norton's theorem.

Exp. 4. To study and transformers and design full wave and half wave rectifiers

Exp 5. To study and explore various components of some electrical appliances of daily

use.

ReferenceBooks:

1. *AtextbookinElectrical Technology*-BLTheraja -S. Chand& Co.
2. *AtextbookofElectricalTechnology*-AKTheraja
3. *Performanceanddesignof ACmachines*-MGSay ELBSEdn.
4. *Electrical circuits: An introduction*-K.C.A. Smith and R.E. Alley-Cambridge University Press
5. *Electrical Circuit Theory and Technology*, Third edition - John Bird – Newnes (Elsevier).

Course Name: Digital Electronics [DPASCC-02]

Credits Equivalent:04 Credits

Course Objectives: The course aims to introduce students to basics building blocks of digital technology. This course will enable the students to understand the basic structure and working of modern digital devices. In skill/hands-on sessions, the students will learn to design the basic building blocks of these digital circuits and study their characteristics.

Contact Hours: 04 Hours per week

Digital Circuits: Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion. BCD, Octal and Hexadecimal numbers. AND, OR and NOT Gates (realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates and application as Parity Checkers.

(6 Lectures)

Boolean algebra: De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Idea of Minterms and Maxterms. Conversion of a Truth table into Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map.

(6 Lectures)

Data processing circuits: Basic idea of Multiplexers, De-multiplexers, Decoders, Encoders.

(4 Lectures)

Arithmetic Circuits: Binary Addition. Binary Subtraction using 2's Complement. Half and Full Adderss. Half & Full Subtractors, 4-bit binary Adder/Subtractor.

(5 Lectures)

Sequential Circuits: SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. M/S JK Flip-Flop.

(6 Lectures)

Timers: IC 555: block diagram and applications: Astable multivibrator and Monostable multivibrator.

(3 Lectures)

Shift registers: Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out andParallel-in-Parallel-out Shift Registers (only up to 4 bits).

(3 Lectures)

Counters(4 bits): Ring Counter. Asynchronous counters, Decade Counter. Synchronous Counter.

(3 Lectures)

Computer Organization: Input/Output Devices. Data storage (idea of RAM and ROM). Computer memory. Memory organization & addressing. Memory Interfacing. Memory Map.

(4 Lectures)

(10 Hours)

Hands-on/skills

Exp.1 To measure (a) Voltage, and (b) Time period of a periodic waveform using CRO.

Half Adder, Full Adder and 4-bit binary Adder.

Exp.2 To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.

Exp.3 To make a 4-bit Shift Register (serial and parallel) using D-type/JK Flip-Flop ICs.

Exp.4 To design an astable multivibrator of given specifications using 555 Timer.

Exp.5 To design a monostable multivibrator of given specifications using 555 Timer.

Reference Books:

1. *Digital Principles and Applications*, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw
2. *Modern Digital Electronics*, R. P. Jain, Tata McGraw Hill
3. *Fundamentals of Digital Circuits*, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt.

Ltd.

4. *Digital Circuits and systems*, Venugopal, 2011, Tata McGraw Hill.
5. *Digital Electronics* G. K. Kharate,2010, Oxford University Press

****

Course Name: Solid State Devices[DPASCC-03]

Credits Equivalent:04 credits

Course Objectives: This course is designed in such a manner so as to enable the students to develop the understanding about the principle and working of the devices which are utilized in the integrated circuit technology. This course will also provide the hands-on experience to the students about the functioning of varioussolid-state devices and their applications.

Contact Hours: 04 Hours per week

Unit 1

Charge particles, field intensity potential and energy, the electron volt(eV), atomic energy level diagram, electronic structure of elements, origin of energy bands, Band theory (qualitative), types of electronic materials: metals, semiconductors, and insulators, energy band structure of metals, semiconductors, and insulators.

(5 Lectures)

Unit 2

Introduction to Semiconductor materials, crystalline structure, Crystal Structure of Silicon and GaAs, Charge transport in semiconductors, Equilibrium electrical properties of semiconductors, mass action law, imperfections in semiconductors, Non-equilibrium electrical properties of semiconductors: drift, drift current, resistivity, charge carrier generation-recombination, mobility and conductivity, intrinsic and extrinsic semiconductors, donor and acceptor impurities, transport of charge carriers in electric/magnetic field, charge densities in a semiconductors.Energy distribution of electron in a metal,Fermi energy, Fermi-Dirac function, carrier concentration in intrinsic & extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature. **(8 Lectures)**

Unit 3

Junction diodes:p-n junctions, ideal p-n junction, depletion width, forward bias, reverse bias, ideal diode equation, minority carrier lifetime, capacitance, energy band diagram of an open circuit p-n junction, fabrication, equilibrium conditions and electrical

characteristics. p-n diode as half wave rectifier, full wave rectifier Varactor diodes, Zener and avalanche breakdown, tunnel diode, Light Emitting diodes (LED), Liquid Crystal Display, Plasma display panel, Photodiode, Solar Cell.

(9 Lectures)

Unit 4

Junction Transistors: metal-semiconductor junctions, ohmic and Schottky contacts, Bipolar transistors; principles, amplification process, electrical charge distribution and transport, current gain, working of NPN ,PNP Transistors connections (C-B, C-E, C-C mode), Transistor characteristic curves. heterojunction bipolar transistors, junction field effect transistors (JFET), metal-oxide-semiconductor field effect transistor (MOSFET), deviations from the ideal MOSFET case, application specific transistors.

(10 Lectures)

Unit 5

Integrated circuits: Integrated circuit technology,Characteristics of Digital ICs, fabrication techniques;Crystal growth, Thermal oxidation, lithography and pattern transfer, Dopant addition and diffusion, Chemical vapor deposition.

(8 Lectures)

(10 Hours)

Hands-on/skills

Exp. 1. To study the VI characteristics of a p-n diode

Exp. 2 To measure the efficiency and ripple factors for Half wave and full wave rectifier circuits.

Exp. 3. Study of Voltage stabilization of a power supply using a Zener diode.

Exp. 4. To measure and plot the common emitter, common base characteristics of a transistor.

Exp. 5. To draw output and mutual characteristics of an FET and determine its parameters.

Reference books:

1. *Solid State Electronic Devices*, Ben G. Streetman and Sanjay Kumar Banerjee, Prentice Hall India, Sixth Edition, 2009.

2. *Physics of Semiconductor Devices*S. M. Sze and Kwok K. NG, John Wiley and Sons, Inc., Third Edition, 2007
3. *Principles of Electronic Materials and Devices*", S. O. Kasap Tata McGraw Hill, Third Edition, 2007.
4. *Introduction to semiconductor materials and devices*, M.S. Tyagi.
5. *Digital Electronics,An Introduction to Theory and Practice* by William H. Gothmann.
6. *Electronic Devices and Circuits*, S. Salivahanan, N. Suresh Kumar, McGraw Hill Education Private Ltd.

****

Course Name: Fundamentals of computer applications [DPASCC-04]

Credits Equivalent:04 credits

Course Objectives:The aim of this course is to prepare students for application of computers specifically for the scientific applications.

Contact Hours:04 Hours per week

Unit-01: Fundamentals of Computer

Introduction to Computers: Definition, Characteristics, Advantages & Limitations. **Anatomy of Computers:** Components of Computer (Input, Output, Storage, ALU, CU CPU) and their functions. **Generations of Computer:** First to 5th Generation **Overview of Input devices of Computer**: Keyboard, Mouse, **Scanners:** Image scanner, OCR, OMR, MICR. **Overview of Output devices of Computer**: Monitors: CRT, LCDs, **Printers:** Dot Matrix, Laser. **Memory**: Units and Types (Primary: RAM/ROM, Cache; Auxiliary Memory: Hard Disk, Memory Cards (SD/MMC), CDs, DVD, Flash Derive.)**Types of Software (System and Application)**: Operating System, **Translators:** Interpreter, Assembler, Compiler &**Programming languages**: Machine, Assembly and HLL **Operating System**: Concept and Functions of OS **Some fundamental Linux Commands**: Internal and External commands **Introduction to Windows:** features of windows, Brief history of Windows, Parts of window screen, types of windows (Application and document windows), and Anatomy of windows.

(10 Lectures)

Unit-02: Computer Programming using FORTRAN

Development of **FORTRAN, Basic elements of FORTRAN:** Character Set, Constants and

their types, Variables and their types, Keywords, Variable Declaration and concept of instruction and program. **Operators:** Arithmetic, Relational, Logical and Assignment Operators. **Expressions:** Arithmetic, Relational, Logical, Character and Assignment Expressions. **Fortran Statements:** I/O Statements|unformatted/formatted|, Executable and Non-Executable Statements, Layout of a Fortran Program, Format of writing a computer Program and concept of coding, Initialization and Replacement Logic. Examples from physics problems.

Control Statements: Types of Logic(Sequential, Selection, Repetition), Branching Statements (Logical **IF**, Arithmetic IF, Block IF, Nested Block IF, SELECT CASE and ELSE IF Ladder statements), Looping Statements (DO-CONTINUE, DO-ENDDO, DO-WHILE, Implied and Nested DO Loops), Jumping Statements (Unconditional GOTO,

Computed GOTO, Assigned GOTO) Subscripted Variables (Arrays: Types of Arrays, DIMENSION Statement, Reading and Writing Arrays), Functions and Subroutines (Arithmetic Statement Function, Function Subprogram and Subroutine), RETURN, CALL, COMMON and EQUIVALENCE Statements), Structure, Disk I/O Statements, open a file, writing in a file, reading from a file. Examples from physics problems.

(15Lectures)

Unit-03: Scientific word processing

Introduction to LaTeX: TeX/LaTeX word processor, preparing a basic LaTeX file, Document classes, preparing an input file for LaTeX, Compiling LaTeX File, LaTeX tags for creating different environments, Defining LaTeX commands and environments, Changing the type style, Symbols from other languages. Equation representation: Formulae and equations, Figures and other floating bodies, Lining in columns- Tabbing and tabular environment, Generating table of contents, bibliography and citation, Making an index and glossary, List making environments, Fonts, Picture environment and colors, errors.

(10 Lectures)

Unit-04: Plotting data

Introduction to graphical analysis and its limitations. Introduction to Gnuplot/xmgrace. importance of visualization of computational and experimental data, basicsGnuplot/xmgrace commands: simple plots, plotting data from a file, saving and

exporting, multiple data sets per file, physics with Gnuplot/xmgrace (equations, building functions, user defined variables and functions), Understanding data with Gnuplot/xmgrace. **(5Lectures)**

Hands-on exercises **(10 Sessions)**

Laboratory exercises:

Exp. 1. Familiarization with Linux and command line

Exp. 2 Hands on tutorials on FORTRAN

Exp. 3. Hands on tutorials on LATEX

Exp. 4. Hands on tutorials on XMGRACE/GNUPLOT

Reference books:

1. *Computer Programming in Fortran 77* V. Rajaraman (Publisher:PHI)
2. *LaTeX–A Document Preparation System*, Leslie Lamport (Second Edition, Addison-Wesley, 1994).
3. *Gnuplot in action: understanding data with graphs*, Philip K Janert, (Manning 2010)
4. *Computer Fundamentals* by Pradeep K Sinha and Priti Sinha (BPB Publications).

Proposal-2

Certificate course in Drone Technologies and their Applications

To meet the basic spirit of New Education Policy (NEP-2020) and to give students the hands-on exposure of state-of-the-art drone technologies, the Department of Physics and Astronomical Science is proposing to establish a working laboratory on drone technology and its applications. The tentative financial expenditure to establish this working facility will be around **Rs. 15 Lakhs** (the quotation attached).

Objectives of the laboratory: Based on this laboratory, the Department of Physics and Astronomical Science will offer skill courses to our UG/PG and RD students and also introduce a certificate course.

The drones and drone-based technologies are holding a bright future and great career perspective for the young minds of the Nation. The students with sound understanding of fundamental Physics grasp the fundamentals of drone technology and also put in their creativity to explore new dimensions for application of this technology.

Proposed Courses: Following courses can be offered based on the above laboratory:

1. 02 credit Skill course on drone flying yielding a **drone piloting license** (subjected to necessary approvals and permissions)
2. 02 credit skill course on fundamental anatomy of drones and drone assembling.
3. 20 credit certificate-course on drone technology and its applications

The outcomes of the above courses will be as follows:

- Will have hands on exposure to drones & drone-related technologies
- Will be able to understand the current needs of the drones and their applications in defence forces.
- Will be having practical knowledge of drone applications such as Agriculture, Logistics, Mapping and Surveillance
- Will be able understand the possibilities of AI Integration on drones for different applications in Defence, Agriculture, mapping, Inspection and Logistics
- Can do own R&D and develop new projects based on drone applications
- Drone pilot License

Proposed course structure for certificate course:

S. No.	Name of course	Credits	Mode
1.	Fundamental aerodynamics and principles of drone flights	02	Theory and Hands-on
2.	Anatomy of drones and types of drones	02	Theory and Hands-on
3.	Motors & Power management in drones	02	Theory and Hands-on
4.	Applications of drones in different areas	02	Theory and Hands-on
5.	Sensors & flight controller in drones	04	Theory and Hands-on
6.	Calibration & programming	04	Theory and Hands-on
7.	Project	04	Practical
	Total credits	**20**	

ANNEXURE-VII

Central University of Himachal Pradesh

Department of Physics and Astronomical Science

School of Physical and Material Sciences

Minutes of the 1st RDC meeting

1ST RESEARCH DEGREE COMMITTEE (RDC) MEETING

HELD ON **15th December, 2022**

Venue: Seminar Hall, Central University of Himachal Pradesh, Shahpur Parisar, Shahpur, Distt. Kangra (HP)

हिमाचल प्रदेश केंद्रीय विश्वविद्यालय

Central University of Himachal Pradesh

(Established under Central Universities Act 2009)

शाहपुर परिसर, शाहपुर, ज़िला काँगड़ा (हि.प्र.) - 176206

Shahpur Parisar, Shahpur, Distt. Kangra (HP) - 176206

Website: www.cuhimachal.ac.in

Minutes of the RDC meeting held on 15.12.2022, Shahpur Parisar.

The meeting of the Research Degree Committee (RDC) of the Department of Physics and Astronomical Science, School of Physical and Material Sciences, Central University of Himachal Pradesh, was held on **15.12.2022**, in the Seminar Room, Shahpur Parisar, from 10.00 AM onwards.

The members discussed the agenda items placed before them in the following order.

1. Agenda item number PAS-RDC-1/22-1:

The agenda was to approve the Research Supervisors to the newly admitted Ph.D. Students of 2021 batch allotted by the Departmental Standing Committee (DSC).

The RDC noted the allotment placed in the **Annexure-VII-A**, and approved all the Supervisors.

2. Agenda item number PAS-RDC-1/22-2

To review the research progress of **Mr. Sandeep Kumar**, Roll No. CUHP20RDPHY06 to make recommendations for upgradation of UGC JRF to SRF and DAE JRF to SRF of **Mr. Akshay Kumar** CUHP21RDPHY02 for DAE-BRNS Project, 58-14-25-2019-BRNS, Dated 27 Nov. 2019. The progress reports are enclosed as **Annexure-VII-B.**

The RD students Mr. Sandeep Kumar, Roll No. CUHP20RDPHY06, and Mr. Akshay Kumar CUHP21RDPHY02, presented their research progress before the members of RDC. For the presentation of Mr. Akshay Kumar, Prof. Amit Ghosh (PC), Theory Division, Saha Institute of Nuclear Physics, and Dr. Sachin Srivastava (CI), were, also, present in the meeting through google meet: https://meet.google.com/rsq-birv-cgv, as DAE representative and as the CI, respectively.

After careful review of their work, the progress was found to be satisfactory, and the committee approved their upgradation from respective JRFs to SRFs.

3. Agenda item number PAS-RDC-1/22-3

To recommend the panel of examiners for evaluation of Ph.D. thesis of Mr. Monal Kashav CUHP17RDPHY06.

The committee approved and recommended the list of examiners.

4. Agenda item number PAS-RDC-1/22-4

Intimation of acting as Co-Supervisor by Prof. Rajesh Kumar, of the PhD Students 1. Ms. Shweta Singh and 2. Mr. Raj Kumar, at the Jaypee university of information technology, Waknaghat **(Annexure-VII-C)**.

The committee noted this information.

5. Agenda item number PAS-RDC-1/22-5

Intimation of acting as Co-Supervisor by Dr. Surinder Paul, Associate Professor, of the Students Mr. Naiem Ahmed and Ms. Sangeeta Devi, at the Arni University **(Annexure-VII-D)**.

The committee noted this information.

6. Agenda item number PAS-RDC-1/22-6

To approve the revised synopsis and supervisor of Mrs. Aditi Sharma, CUHP17RDPHY01.

The committee approved the synopsis and supervisor.

The following members were present in the RDC meeting.

External Experts:

1. Prof. Naresh Padha
2. Prof. Nagesh Thakur
3. Prof. Rajinder Kumar Modgil

Internal Members:

1. Prof. Bhag Chand Chauhan
2. Prof. OSKS Sastri
3. Prof. Hum Chand
4. Prof. Rajesh Kumar
5. Dr. Dalip Singh Verma
6. Dr. Surender Verma
7. Dr. Pawan Heera
8. Dr. Surinder Paul
9. Dr. Ayan Chatterjee
10. Dr. Rajesh Kumar Singh
11. Dr. Surender Pratap
12. Dr. Gourishankar Sahoo
13. Dr. Noorjahan
14. Dr. Vikas Anand

The following persons were, also, present during the presentation of **Mr. Akshay Kumar**, in regards to **Agenda item number PAS-RDC-1/22-2**.

1. **Prof. Amit Ghosh**
   Professor, Theory Division
   Head, Scientific Information
   & Resources Division and Group E
   Saha Institute of Nuclear Physics
   Sector 1, Block AF, Bidhan Nagar
   Kolkata 700064, INDIA.

2. **Dr. Sachin Srivastava**
   Assistant Professor (CI)
   Srinivasa Ramanujan Department of Mathematics
   Central University of Himachal Pradesh.
   Shahpur Parisar, Kangra.

Annexure-VII-A

हिमाचल प्रदेश केंद्रीय विश्वविद्यालय

Central University of Himachal Pradesh

(Established under Central Universities Act 2009)

शाहपुर परिसर, शाहपुर, जिला काँगड़ा (हि.प्र.) - 176206

Shahpur Parisar, Shahpur, Distt. Kangra (HP) - 176206

Website: www.cuhimachal.ac.in

फाइल संख्या : PAS/1-2/(DSC)/CUHP/21/[illegible]

दिनांक: 27-01-2022

अधिसूचना

हिमाचल प्रदेश केंद्रीय विश्वविद्यालय के अध्यादेश **42**, धारा **5**, उपधारा **5.2(iv)** के अनुसार, भौतिकी एवं खगोल विज्ञान विभाग, भौतिकी एवं पदार्थ विज्ञान स्कूल में पीएच.डी. अध्ययन कार्यक्रम के शोधार्थियों के पर्यवेक्षण के लिए निम्नलिखित संकाय सदस्य को अनुसन्धान पर्यवेक्षक के रूप में नियुक्त किया जाता है।

क्र. स.	शोधार्थी का नाम	विश्वविद्यालय रोल नंबर	पर्यवेक्षक का नाम
1.	Aishwarya Thakur	CUHP21RDPHY01	Prof. Bhag Chand Chauhan
2.	Akshay Kumar	CUHP21RDPHY02	Dr. Ayan Chatterjee
3	Aman Kumar	CUHP21RDPHY03	Prof. Bhag Chand Chauhan
4	Arushi Sharma	CUHP21RDPHY04	Prof. O.S.K.S. Sastri
5	Ayushi Awasthi	CUHP21RDPHY05	Prof. O.S.K.S. Sastri
6	Dharmender	CUHP21RDPHY06	Prof. Hum Chand
7	Diksha	CUHP21RDPHY07	Dr. Rajesh Kumar Singh
8.	Himanshu Sharma	CUHP21RDPHY08	Prof. Hum Chand
9	Madhu Sudan	CUHP21RDPHY09	Prof. Hum Chand
10	Pooja Chauhan	CUHP21RDPHY10	Dr. Dalip Singh Verma
11	Priya	CUHP21RDPHY11	Prof. Bhag Chand Chauhan
12	Rahul Sharma	CUHP21RDPHY12	Dr. Noor Jahaan
13	Ritesh Kumar	CUHP21RDPHY13	Dr. Rajesh Kumar Singh
14	Sahil Devdutt	CUHP21RDPHY14	Dr. Ayan Chatterjee
15	Shreya Sinha	CUHP21RDPHY15	Dr. Noor Jahaan
16	Shruti Rialch	CUHP21RDPHY16	Dr. Gourishankar Sahoo
17	Shweta Kumari	CUHP21RDPHY17	Dr. Surender Prtap
18	Suryakanta Swain	CUHP21RDPHY18	Dr. Gourishankar Sahoo
19	Tapender	CUHP21RDPHY19	Dr. Surender Verma
20	Vinod Kumar	CUHP21RDPHY20	Dr. Surender Prtap
21	Vivek	CUHP21RDPHY21	Dr. Dalip Singh Verma

यह अधिसूचना अनुसधान डिग्री समिति के अनुमोदन के अधीन है।

प्रो० हुम चद
प्रोफेसर
चेयरमैन (DSC)

प्रो० जी० एस० के० एस० मारवी
प्रोफेसर
सदस्य

[illegible]
सदस्य

[illegible]
सहायक प्रोफेसर
वरिष्ठतम सहायक प्रोफेसर

डॉ दलीप सिह वर्मा 27/01/2022
सहायक प्रोफेसर
अन्य पिछडा वर्ग
प्रतिनिधि

[illegible]
सहायक प्रोफेसर,
अनुसूचित जनजाति प्रतिनिधि

डा शिवानी बेरी
सहायक प्रोफेसर,
महिला प्रतिनिधि

प्रो० हुम चद
[illegible]
भौतिक एव खगोल वेज्ञान वेभाग

Annexure-VII-C

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY

Ref. No. JUIT/WKG/REG/2021-22/ [illegible]60 May 18, 2022

E- mail Transmission

Prof. Rajesh Kumar
Professor & Head
Dept of Physics and Astronomical Sciences
School of Physics and Materials Science
Central University, Dharamshala
HP - 176215

Sub:- Change from Supervisor to Co-Supervisor for Ph.D Research Scholar Mr. Raj Kumar (186907) and Ms. Sweta Singh (196902).

Dear Sir,

You were Supervisor for the Ph.D Research Scholar Mr. Raj Kumar (186907) and Ms. Sweta Singh (196902) for Ph.D research work during your tenure in the University. However, you resigned from the services of the University and relieved from the services of the University on 14 March, 2022.

In such case as per Clause 7 (iv) G) of the JUIT Regulations and Ordinances, new supervisor has to be allotted to the scholar and original supervisor be continued as Co-Supervisor of the said research scholar. The relevant extract of the above clause is reproduced hereunder for your better understanding:-

> **G) In case a Supervisor moves out of JUIT before submission of synopsis by the candidate then a new supervisor is to be recommended by Dean (A&R) and the HoD of the Department where the Scholar is registered. However, original Supervisor may continue as Co-Supervisor if available and willing; provided he/s he has supervised the Scholar for at least one year.**

Considering above clause of the regulations and ordinance, you are requested kindly to accord your written consent for acting as a Co-Supervisor for above mentioned scholar to the undersigned on or before 30 May, 2022, failing which it will be presumed that you are no longer interested in supervising the said scholars as Co-Supervisor and further action as per the regulations and ordinance will be initiated in the case.

Thanking you.

Yours sincerely,

Assistant Registrar (Academic)

Annexure-VII-D

ARNI UNIVERSITY
bringing ambition to life

Arni University established under Act No.23 of Govt. of H.P. and Notified vide Notification No: EDN-A-Ka (1)-23/2007 Dated 03.11.2009
Notified by UGC as University under Section 2 (f) of UGC Act, 1956 vide notification No: 8-5/2010 (CPP-IPU) Dated 03-03-2011

Ref. No. Adm/13197
Date 10/05/2022

Performa for Joint-Supervisor for supervising / guiding Doctoral Research for award of Ph.D. Degree

(to be submitted to the Dean (Research, Innovation and Consultancy)

Name of Joint-Supervisor *(in Capital Letters)*: DR.SURINDER PAUL
Designation: Associate Professor
Institute: Central University of Himacal Pradesh (CUHP) Shahpur campus
Office Address: Department of physics and Astronomical science. (CUHP) Shahpur campus, Kangra, H.P India Pin176206
Contact Nos: +91- 9816134688
E-Mail ID: Surinderpaul79@gmail.com
Discipline: Physics
Specialization: Condensed matter physics, Material sciences, Nanotechnology and SOFC's

Recommendation and approval by the Supervisor

I Dr. Neha Sharma Designation. Asst. Professor Department of Physics Arni University, Supervisor of Naeem Ahmed Reg.ID. APPHOORTA/21 session. 2021 onward for award of Ph.D degree in Physics, recommend and approve Dr. Surinder Paul to be joint supervisor in the Ph.D research work of Naeem Ahmed. It is also certify that I am registered supervisor in Arni University and fulfill all the eligibility criteria to be act supervisor according to University Grants Commission (Minimum Standards and Procedures for Award of Ph.D. Degree) Regulations, 2022

Date:

Neha Sharma
(Signature)

Name of Supervisor: Dr. Neha Sharma
Designation: Asst. Professor
E-mail I.D: nehasdr6600@gmail.com
Institute: Arni University, Kathgarh (H.P.)

To be forwarded by the Head of the Institute

Date:

Signature of Vice Chancellor
(With Seal)
(Where supervisor is working)
(Note: Form will not be accepted without signature of Principal/stamp)

ARNI UNIVERSITY
bringing ambition to life

Arni University established under Act No. 23 of Govt. of H.P. and Notified vide Notification No. EDN-A-Ka(1)-23/2007 Dated 03.11.2009
Notified by UGC as University under Section 2 (f) of UGC Act, 1956 vide notification No. 8-5/2010 (CPP-1PU) Dated 03-03-2010*

Ref. No. Adm/13198
Date 10/05/2022

Performa for Joint-Supervisor for supervising / guiding Doctoral Research for award of Ph.D. Degree

(to be submitted to the Dean (Research, Innovation and Consultancy)

Name of Joint-Supervisor *(in Capital Letters)*: DR.SURINDER PAUL
Designation: Associate Professor
Institute: Central University of Himacal Pradesh (CUHP) Shahpur campus
Office Address: Department of physics and Astronomical science. (CUHP) Shahpur campus, Kangra, H.P India Pin176206
Contact Nos: +91- 9816134688
E-Mail ID: Surinderpaul79@gmail.com
Discipline: Physics
Specialization: Condensed matter physics, Material sciences, Nanotechnology and SOFC's

Recommendation and approval by the Supervisor

I, Dr. Neha Sharma, Designation Asst. Professor, Department of Physics of Sangeeta Devi, Arni University, Supervisor of Reg.ID. APPH00022A/21 session 2021 onward for award of Ph.D degree in Physics, recommend and approve Dr. Surinder Paul to be joint supervisor in the Ph.D research work of Sangeeta Devi. It is also certify that I am registered supervisor in Arni University and fulfill all the eligibility criteria to be act supervisor according to University Grants Commission (Minimum Standards and Procedures for Award of Ph.D. Degree) Regulations, 2022

Date:

Neha Sharma
(Signature)

Name of Supervisor: Dr. Neha Sharma
Designation: Asst. Professor
E-mail I.D: nehasdr6600@gmail.com
Institute: Arni University, Kathgarh (H.P.)

To be forwarded by the Head of the Institute

Date:

Signature of Vice Chancellor
(With Seal)
(Where supervisor is working)
(Note: Form will not be accepted without signature of Principal/stamp)

Annexure-VIII

Course-1

Quantum Field Theory (before Jan 2022)

Course Code:PAS426A **Course Type: ES-1**
Course Credit: 4
Course Objectives:
Quantum field theory is the basis of modern theory of microscopic physics. This course provides us with a set of mathematical rules which when computed for physical processes give highly accurate results. Moreover, the formulation of these quantum field theories provides deep insights towards the mathematical, physical and philosophical foundations of the microscopic world. The plan of this course is to introduce the basics of field quantization. Students will learn the quantum theoretic descriptions of the electromagnetic, the weak and the strong forces and standard electroweak theory.

Course Outcomes: After the completion of the course, the students wil be able to

CO1: *Quantize free fields (both canonical quantization) and shall explain Fermions as representations of the symmetry group, n -point correlations.*

CO2: *Understand dynamics of Interacting fields; Wick contractions; Feynman rules and will be able to apply it to other physical processes.*

CO3: *Calculate scattering cross-sections for simple processes (both scalar theory and QED).*

Course Contents

Unit 1: Theory of classical fields and symmetries **(9 hours)**

- Why quantum field theory, creation and annihilation operators
- relativistic notation and natural units
- Action principal and the Euler- Lagrange equations, Hamiltonian formalism, Noether theorem

Unit 2: Quantisation of free fields **(9 hours)**

- Scalar fields, field and its canonical quantization, ground state and Hamiltonian, Fock space
- Complex scalar fields and propagator
- Dirac fields, Hamiltonian, free particle solutions, projection operators
- Lagrangian, Fourier decomposition and propagators

Unit 3: S-matrix, Cross- sections and decay rates **(9 hours)**

- Evolution operator, S-matrix and Wick's theorem
- Yukawa interaction, fermion scattering, Feynman amplitude and rules

- Decay rates and scattering cross-sections
- Four fermion interaction
- Mandelstam variables

Unit 4: Quantum electrodynamics **(9 hours)**

- Classical electromagnetic fields and quantization problems
- Modified Lagrangian, propagator, Fourier decomposition, Feynman rules for photons
- Local Gauge invariance and it's consequences: U(1), SU(2) and SU(3).
- Interaction Hamiltonian, e-e scattering

Unit 5: Renormalization **(9 hours)**

- Degree of divergence, Specific Example of QED
- Self energy, vacuum polarization, Vertex function
- Regularisation of self energy, modified Coulomb interaction
- Running coupling constant, cancellation of infrared divergences

Unit 6: Non-Abelian gauge theories and Standard electroweak theory **(15 hours)**

- Spontaneous symmetry breaking, Goldstone bosons, Higgs Mechanism
- Yang-Mills theory of non-Abelian gauge fields
- Interaction of gauge fields
- Feynman rules, colour factors, QCD Lagrangian
- Gauge group, Fermions in theory
- Gauge boson decay
- Scattering processes
- Propagators, global symmetries of the model

Prescribed Text books:

1. A. Lahiri and P.B. Pal- A First Book of Quantum Field Theory 2nd edn., Narosa Pub. (2004).
2. G. Sterman- An Introduction to Quantum Field Theory, Cambridge University Press (1993).

Prescribed Reference books:

1. F. Mandl and G. Shaw- Quantum Field Theory 2nd Edition, Wiley & Sons (2010).
2. Peskin and D. Schroeder- An Introduction to Quantum Field Theory, Levant Books (2005).
3. P. Ramond- Field Theory: A Modern Primer, Westview Press (1995).
4. S. Weinberg- Quantum field theory, Cambridge University Press (1998).

Quantum Field Theory (For July 2022 onwards)

Course Code: PAS9105A* **Course Type: RLRP (ES-1)**

Course Credit: 4

Course Objectives: *Quantum field theory is the basis of modern theory of microscopic physics. This course provides us with a set of mathematical rules which when computed for physical processes give highly accurate results. Moreover, the formulation of these quantum field theories provides deep insights towards the mathematical, physical and philosophical foundations of the microscopic world. The plan of this course is to introduce the basics of field quantization. Students will learn the quantum theoretic descriptions of the electromagnetic, the weak and the strong forces and standard electroweak theory.*

Course Outcomes: After the completion of the course, the students wil be able to

CO1: *Quantize free fields (both canonical quantization) and shall explain Fermions as representations of the symmetry group, n -point correlations.*

CO2: *Understand dynamics of Interacting fields; Wick contractions; Feynman rules and will be able to apply it to other physical processes.*

CO3: *Calculate scattering cross-sections for simple processes (both scalar theory and QED).*

Academic Integrity:

Integrity and responsible beheviour must be part and parcel of your academic work at CUHP. Many a times, you may get a large number of problem sets, assingments or projects to be submitted in short time. We ask you not to feel overwhelmed by the amount of work you need to accomplish. Whether you are working on a problem set, lab report or project, avoid engaging in plagiarism, unauthorized collaboration, cheating, or facilitating academic dishonesty. You are allowed and encouraged to discuss with your friends but when you write, you must believe in your own intellect and do things on your own. Deviations from academic integrity, as defined above, shall lead to reduction of marks.

***PAS9106A for july 2023 onwards.**

Course Contents

I. Theory of fields and the Lorentz group (12 hours)

Action functional: General properties and the Euler- Lagrange equations.
Symmetries and conservation laws: Noether's theorem and conserved charges. Examples. Brief introduction to Lorentz and Poincare groups.

II. Canonical quantisation of free fields (12 hours)

Real scalar theory: Field quantisation, propagators and implications for causality. Extension to complex scalar fields. Dirac fields: Free particle solutions of the Dirac equation, Dirac matrices and Dirac bilinears. Trace and contraction theorems for gamma matrices. Quantisation of Dirac field, propagators.

III. Perturbation theory for interacting fields, Cross- sections and decay rates

(10 hours)

Interacting fields: Covariant perturbation theory, perturbation expansion of correlation functions. Wick's theorem and Feynman diagrams ($\lambda\varphi^4$ theory). Cross- sections and decay rates: S matrix. Computing S- matrix elements from Feynman diagrams. Simple examples.

IV. Gauge theories (6 hours)

Brief introduction to Lie groups and algebras Gauge invariance as a physical principle: Constructing theories with local U(1), SU(2) and SU(3) invariances. Ward identities and its consequences.

V. Quantum electrodynamics: (15 hours)

Quantum electrodynamics: Feynman rules, Casimir's trick, Example of actual calculations (tree level): Rutherford, Bhabha and Compton scattering. Mandelstam variables and crossing symmetry.

VI. Higher order corrections: (5 hours)

One-loop diagrams. Basics of Renormalisation and regularisation, Degree of divergence. Explicit calculation of self energy of scalar in ($\lambda\varphi^4$ theory) using cut- off or dimensional regularisation. Naturalness and unitarity.

Text books:

1. M. Peskin and D. Schroeder: Quantum field theory. Westview press (1995).
2. D. Griffiths: Introduction to particle physics, Prentice Hall.
3. F. Mandl and G. Shaw: Quantum Field Theory, John Wiley.
4. S. Weinberg: Quantum field theory, Cambridge university press (1998).

Reference Books:

1. J.D. Bjorken and S.D. Drell: Relativistic Quantum Fields, Wiley.
2. P. Ramond: Field theory: a modern primer, Westview press (1995).
3. C. Itzykson and B. Zuber: Quantum Field Theory, McGraw Hill.
4. Ashok Das: Quantum field theory, World Scientific.
5. W. Greiner, Field quantisation, Springer.

Course-2

Quantum Mechanics (before July 2022)

Course Code:PAS8104 **Course Type: Minor**

Credits: 4

Course Objectives:

The purpose of the course is to provide a comprehensive introduction and application of the quantum mechanics and develop pre-requisite for the next course 'Advanced Quantum Mechanics'. Starting from Fundamentals of Quantum Mechanics, Mathematical Formalism, Representation Theory, Eigenfunctions, Eigenvalues, Unitary Matrix, Schrodinger and Heisenberg representations; Energy Eigenvalue Problems; Matrix Representations, Angular Momentum Operators and Addition of Angular Momenta, Time Independent Perturbation Theory, Variational Principle and WKB Method.

Course Outcomes:

On completion of the course the student should have the following learning outcomes defined in terms of knowledge, skills and general competence: The student has gained knowledge about

CO1: *basic non-relativistic quantum mechanics*

CO2: *the time-dependent and time-independent Schrödinger equation for simple potentials like for instance the harmonic oscillator and hydrogen like atoms, as well as the interaction of an electron with the electromagnetic field*

CO3: *quantum mechanical axioms and the matrix representation of quantum mechanics*

CO4: *approximate methods for solving the Schrödinger equation (the variational method, perturbation theory, Born approximations)*

CO5: *spin, angular momentum states, angular momentum addition rules, and identical particles*

Course Contents

Unit 1: Fundamentals of Quantum Physics **(10 hours)**

- Schrodinger's equation, Statistical interpretation of the wave function and normalisation
- Expectation values of operators, Ehrenfest's theorems
- Stationary solutions. Normalisable and non- normalizable states
- Eigenvalues and eigenfunctions, orthornormality and completeness of solutions
- Simple one- dimensional potentials: Square- well and delta function
- Free particle: Non-normalisable solutions, wave packets, box normalisation
- Momentum space representations, Perseval's theorem.

Unit 2: Mathematical Foundations **(8 hours)**

- Finite dimensional linear vector space and inner product spaces
- Dual spaces and the Dirac notation of bra and ket
- Linear transformations (operators) and their matrix representations

- Hermitian and unitary operators and their properties
- Generalisation to infinite dimensions
- Incompatible observables, Uncertainty relation for two arbitrary operators and it's proof.

Unit 3: Quantum dynamics **(4 hours)**

- Schroedinger picture: Unitary time evolution, Schrodinger equation
- Heisenberg picture: Heisenberg operators, Heisenberg's equation of motion
- Linear Harmonic Oscillator by operator method and it's time evolution.

Unit 4: Three dimensional problems **(4 hours)**

- Three dimensional problems in Cartesian and spherical coordinates
- Square wells and harmonic oscillator
- Hydrogen atom, Radial equation and it's solution.

Unit 5: Angular Momentum **(4 hours)**

- Angular Momentum Operators and their algebra
- Eigenvalues and Eigenfunctions
- Matrix representations for different j
- Spin Angular Momentum and Addition of Angular Momenta
- Clebsch-Gordan Coefficients.

Unit 6: Time Independent Perturbation Theory **(6 hours)**

- Basic Concepts, Non-degenerate Energy Levels
- First and Second Order Corrections to the Wave function and Energy
- Degenerate Perturbation Theory
- Relativistic correction and Spin-orbit Interactions
- Zeeman Effect and Stark Effect.

Unit 7: The Variation Method and WKB Approximation **(4 hours)**

- The Variation Principle, Rayleigh-Ritz Method
- Variation Method for Excited States
- Ground State of Helium
- WKB Method, Connection Formula
- Validity of WKB Method
- Tunnelling through a Barrier and alpha decay.

Prescribed Textbooks:

1. David J. Griffiths, Introduction to Quantum Mechanics, Pearson Prentice Hall, Inc.
2. J.J. Sakurai, Modern Quantum Mechanics, Addison-Wesley ISBN 0-201-06710-2.
3. R. Shankar, Principles of Quantum Mechanics, Second edition, Plenum Press, New York.
4. E. Marzbacher, Quantum Mechanics, Wiley Student Edition, 2011.
5. Mathews and Venkateshan, Quantum Mechanics, Tata McGraw-Hill 2010.

Reference books:

1. Ashok Das, Quantum Mechanics, Tata McGraw Hill (2007).
2. Leonard. I. Schiff, Quantum Mechanics, 3 edition, Tata McGraw-Hill 2010.
3. S. Weinberg, Quantum mechanics, Cambridge University press.
4. P.A.M. Dirac, The Principles of Quantum Mechanics, Cambridge University press.
5. A. Messiah, Quantum Mechanics, Dover.

Quantum Mechanics (For July 2022 onwards)

Course Code: **PAS 8104**
Course Type: **Major**
Credits: **4**

Course Objectives:
The students would learn the following:

1. Postulates of Quantum Mechanics (QM)
2. Operators in QM and matrix methods
3. Hamiltonian Formulation of Supersymmetric (SUSY) QM
4. Time Independent Perturbation Theory, Variational method and WKB Method.
5. Solving Time Independent Schrodinger Equation (TISE) for various potentials both analytically and using numerical techniques based on Central Divivded Difference, Matrix Numerov Matrix Method and Matrix Methods using Sine basis

Course Contents

Unit 1: Fundamentals of Quantum Physics: (15hours)

- Lectures 01 and 02: Feynman's double slit experiment with electrons: Modeling the electron's wavepacket; It's Statistical interpretation and normalisation;
- Activity 01: Canned experiment of double slit using electrons: Analysis using Tracker video analysis software
- Lecture 03 and 04: Construction of wavepacket: It's Mathematical formulation as Fourier transform; Concept of Measurement in QM: ensemble average and uncertainty;
- Problem Session 01:
  - Fourier transform of rectangular and gaussian amplitude functions in k-space leading to construction of wavepackets in position space;
  - Determination of width of gaussian wavepacket in both position and momentum space and Heisenberg's uncertainty product
- Activities 02 and 03:
  - Numerical Simulation of Fourier superposition of waves;
  - Numerical Simulation of wavepacket construction using superposition of waves and Fourier transform
- Lecture 05: Derivation of operator expression for momentum in position space; Expectation values of operators; Time dependent Schrodinger equation (TDSE).
- Lecture 06: Time independent Schrodinger equation (TISE); Particle in 1-D Box
- Problem Session 02: Stationary and non-stationary states, normalisation and probability current densities
- Activity 04: Numerical simulation of TISE using central divided difference (CDD) technique in gnumeric worksheet environment and Scilab/Python
- Lecture 07: Evolution of Gaussian wavepacket and the importance of measurement in QM

- Activity 05: Numerical simulation of evolution of Gaussian wavepacket using Crank-Nicholson method for solving TDSE

Unit 2: Postulates of Quantum Mechanics: **(15 hours)**

- Lecture 08 and 09: Operators in QM:
  - Linear and Hermitian properties and consequences; Commutators;Adjoint operator; Parity operator;Simultaneous eigenstates; Eigenstates and measurement; Expansion postulate;
- Problem Session 03: Commutation relations involving position and momentum operators
  - Dirac Bracket notation;Compatible and incompatible observables; Generalised Heisenberg's uncertainty principle; Conserved quantities and Constants of motion; Time development of an expectation value; Ehrenfest's theorem;
- Lectures10 and 11:Expansion and Reduction Postulate:
  - The generalised Born interpretation and
  - Role of measurment in QM
- Lecture 12: Expanding square well: An example
- Problem Session 04:Energy measurements on non-stationary states and variations of expanding square well
- Lecture 13: Finite square well (FSW)
- Activity 06: Obtaining eigen values for FSW using Bisection and Newton-Rapson method
- Activity 07: Numerical simulation of Finite square well using Numerov matrix method (NMM)
- Lecture 14: Matrix methods of QM
- Activity 08: Numerical solution of Finite square well using matrix methods with sine basis (MMS)

Unit 3: Supersymmetric (SUSY) Quantum Mechanics Technique: **(15 hours)**

- Lecture 15:Hamiltonian Formulation of Supersymmetric (SUSY) QM
  - Factorisation and Hirerachy of Hamiltonians
- Lecture 16:Linear Harmonic Oscillator (HO)using SUSY
- Problem Session 05:Expectation values and uncertainty product
- Activity 09:Numerical solution of HO using CDD, NMM and MMS
- Lecture 17 and 18: 3D problems in Cartesian and spherical polar coordinates
  - Square well
  - Rigid rotator and
  - Harmonic oscillator
- Lecture 19:Angular Momentum Operators and their algebra
- Lecture 20: Eigenvalues and Eigenfunctions for angular momentum operators
- Activity 10: Numerical Simulation of Molecular vibrations and rotations
- Lecture 21:Hydrogen atom, Radial equation and it's solution using SUSY
- Activity 11: Numerical solution of Hydrogen atom using CDD, NMM and MMS
- Lectures 22 and 23: Normal Zeeman Effect and Stark Effect.

- Activity 12: Numerical solution of applying external electric field to square well

Unit 4: Approximation methods: **(15 hours)**

- Lectures 24 and 25: WKB Method,
  - Connection Formula
  - Validity of WKB Method
- Lecture 26: Tunnelling through a Barrier and alpha decay.
- Lecture 27:Supersymmetric WKB Approximation
- Problem Session 06: Applications of WKB to obtain energy eigen values and eigen states for various potentials
- Lecture 28:Time Independent Perturbation Theory
- Activity 13: Numerical Solution of Anharmonic Oscillator using MMS
- Lecture 29:Degenerate Perturbation Theory
- Lecture 30:The VariationalMethod or Rayleigh-Ritz method
- Activity 14: Application to AHO and Hydrogen ground states
- Lecture 31:Hamiltonian for Helium atom and self-consistent formalism
- Lecture 32:Ground state of Helium
- Activity 15: Obtaining the ground state of He using variational method numerically

Lecture Notes and Lab manual, 2022:
O. S. K. S. Sastri, Quantum Physics Simulations using Gnumeric and Scilab,
Available on https://dpas.saivyasa.in/

Prescribed Textbooks:

1. Michael A Morrison, Understanding Quantum Physics-A User's Manual, Vol 1, {rentice Hall Inc, 1990
2. Amit Goswami, Quantum Mechanics, Second Edition, Waveland Press Inc, 1997
3. Avinash Khare, Frederick M Cooper and Uday P Sukhatme, Supersymmetry in Quantum Mechanics, World Scientific, 2001
4. G. Aruldhas, Quantum Mechanics, PHI Learning, Eastern Economy Edition 2013.
5. W. Greiner, Quantum Mechanics-An Introduction, Springer-Verlag, Germany.
6. David J. Griffiths, Introduction to Quantum Mechanics, Pearson Prentice Hall, Inc.
7. N. Zettili, Quantum Mechanics: Concepts and Applications, Wiley, 2009

Other Resources/Reference books:

1. A K Ghatak and S Lokanathan, Quantum Mechanics, Trinity, 6th edition, 2022.
2. Ashok Das, Quantum Mechanics, Tata McGraw Hill (2007).
3. Leonard. I. Schiff, Quantum Mechanics, 3 rd edition, Tata McGraw-Hill 2010.
4. J. J. Sakurai, Modern Quantum Mechanics, Addison-Wesley ISBN 0-201-06710-2).
5. R. Shankar, Principles of Quantum Mechanics, Second edition, Plenum Press, New York.E.
6. Marzbacher, Quantum Mechanics, Wiley Student Edition, 2011.
7. Mathews and Venkateshan, Quantum Mechanics, Tata McGraw-Hill 2010.
8. P.A.M. Dirac, The Principles of Quantum Mechanics, Snowball Publishing.
9. A. Messiah, Quantum Mechanics, Dover Books on Physics.

Annexure-IX

Guidelines and Course Contents for Community Connect Project Course

Programme of Study: Undergraduate

Course Name: Community Connect Project*

Course code: PAS6105

Course Credits: 04

The Unnat Bharat Abhiyan (UBA) scheme of the Ministry of Education is an initiative to connect institutions of higher learning with the community. The prime objective of this scheme is to provide a linkage between institutions and communities to employ technologies for upliftment of quality of life of Indian citizens (specifically in rural India). Central University of Himachal Pradesh is dedicated to impart quality education to youth of the country. Alongside this the university is engaged into welfare of adopted villages in the nearby areas through various community connect programs.

In this direction, Central University of Himachal Pradesh has introduced a compulsory Community Development Programme (CDP) for all students of the university to address the need to recreate and rebuild community initiatives, promoted both in the private and public sector. This course specifically targets all students of Graduation (UG) to understand community life, the challenges of program implementation, and the wide range of services and finances available mainly from the government and other non-statal players and the issues of the rural poor. CDP programme is an opportunity for students to explore, and apply an interdisciplinary set of theories useful for understanding and acting within the field of community and regional development in Hindi as well as English language. The students will examine the participatory processes and plans developed by academic and rights based institutions like micro level plans and participatory processes to familiarize themselves with the complexity and effectiveness of planning with the people. The course will also go through an examination of some of the relevant Acts and Policies that have emerged in the last few decades, which have been instrumental in carrying forward the benefits of growth and change to the most excluded communities and people.

*The name of the course is "Community Connect" for Session July-Dec 2022.

Under the National Education Policy (NEP2020), UBA, Atmanirbhar Bharat and Vocal for Local slogan of our Prime Minister Sh. Narendra Modi ji to actively engage students with the community service, CUHP has introduced a 04 credits project course for the undergraduate students. The duration of the project will be for one semester i.e. 3rd Semester, during which the students have to work mainly on any of the identified social development issues. This course shall encourage the young minds to explore the creative ideas and contribute for sustainable development of rural India.

Objectives of the Programme: The main objective of Community Development Programmes is to learn by doing, improve the standard of living of the village people. They have been provided with various employment facilities and opportunities to set up industries and the training to improve their agricultural production. The major objectives of this course:

- Understand the concept of community engagement in higher education (NEP-2020)
- Experiential learning of best practices in community engagement
- Participate effectively in the community service
- Develop insights and field realities on indignity and indigenous models.
- To change the outlook of all village people.
- To improve existing village crafts and industries and organizing new ones, providing minimum essential health services and improving health practices.
- Improving housing and family living conditions of villagers.
- Explore models of art, craft for entrepreneurship for self-reliance.
- To develop village people so that they become self-reliant and responsible citizens.
- Understand various real, community stories of children, families.
- Discover latent talents in the traditional occupations and devise contextually suitable engagement activities
- Promote village occupations with literacy, technology integration and research tocreate entrepreneurs.
- Organize or arrange trainings for voluntary local leaders like members of panchayats, village and block advisory committees

- Identify the strengths, abilities, and resources of the students of the department, and utilize the same for the welfare of the society.
- Study the social and economic status and awareness level of the target community.
- Identify the issues, which can be targeted and resolved.
- List the other problems and issues in the growth and development of the society.
- Use your skills and resources to help society and find solutions.
- Effectively understand and communicate the problems of society.
- Analyse various concepts of ICT for community development, Govt Policies on community development work.
- Make a detailed action plan to resolve the issues and make society sustainable.
- Prepare a detailed report on the community development issues and resolutions done.

Learning Outcomes

- The students will be able to analyse and identify the social issues and contribute their academic knowledge to improve the quality life of the community people.
- Student will enhance their life skills, and have a good community connect, which will help them to excel in life and contribute efficiently for social transformation for new India.
- Studying the village issues and helping people will lead to the overall personality development of the students.
- This effort of the students will help villages to grow economically and socially towards sustainable development.
- Institute and community bonding will be enhanced and in turn that would act as an accelerator towards the all-round growth and development of the country.
- Display a working knowledge of various concepts of involvement for rural development.
- Explore models of art, craft for entrepreneurship for self-reliance and demonstration of
  Traditional Knowledge Systems (IKS).
- On successful completion of this course, students will acquire the detailed knowledge of following aspects of rural community development.

- This course will make students more experienced and a better citizen.

Suggestive Key Issues

- Social mobilization and awareness programmes about the Govt. flagship programmes and welfare schemes for the upliftment of the marginalized communities.
- Awareness on efficient energy usage
- Awareness on energy harvesting; such as electricity using solar/wind/water energy
- Rainwater harvesting, soil and water conservation
- Stray cattle and animal menace
- Energy storage devices and their usage for common public
- Activities under Swachch Bharat Abhiyan; waste management
- Awareness on E-Waste and its management: Reuse and proper disposal
- Implementation of innovative technologies, which ease day to day life of people
- Awareness programmes on good parenting, protection of local culture and value system, traditional knowledge (lok-vidya), protection of endangered species and plants, crops, and animals, etc
- Organizing yoga camps, sports and cultural activities for and by the local people.
- Making audio-visual demonstrations and nukkad-natak for massive awareness on various burning issues; e. g. drug abuse, mobile and social media abuse
- Awareness programmes on social media technologies, including digital transactions, digilocker, e-commerce, cyber security, tele-medicines, remote sensing, weather forecast, and Kisan help appsetc.
- Help the rural students in school and colleges in their studies by offering them course tutorials and making small Academic Help Groups (AHGs)
- Awareness among the rural students regarding various employment perspectives in government and private sectors.

Action Plan and Execution

Literature Survey and Field Preparation

In the first month, go through the survey reports and information literature available, and learn in detail about the existing government schemes, government functioning,

Panchayati Raj Institutions (PRI), geographical location, socio-economic and cultural status of the village, various NGOs working on the development related issues, potential fund resources and company CSRs.

Once the target village/ community is identified, arrange the means of transport, contacts of govt. offices and officials, PRI members and native resourceful persons (e.g. retired employees, army men, social workers, spiritual leaders, educated and well settled people, etc.), NGO groups in and around, if any.

Coordination and Working with Local Representatives

The students with the help of community connect cell and the teacher shall arrange for public interactions where he/she can educate people on the project, its importance in their life and benefits that can be extracted from the solutions proposed.

Contact the resourceful people of the village and visit the community to have an interaction session. List the problems, issues, and resources of the village. Identify the simple and priority issue, which can be and need to be addressed first.

Arrange the visits around and make people aware of the various govt. schemes and the activities, which you have in mind.

Scopes for Implementation

The students should explore possibilities of implementation of available options in reference to the problem identified on the basis of community chosen. The amendments can be suggested for optima impact of the schemes/model.

Prepare a social map to have better connect and understanding of the village community. Once the issue or problems are identified and listed, student should explore the available viewpoints, resources, options, schemes related and make an action plan to address the easiest and priority-based problem / issue of the people. Some creative idea/device/model may be implemented in the village/ community.

Motivate and seek their maximum involvement to resolve the problems and issues. With their involvement, try to find out the permanent and sustainable solutions. Develop the Participatory Rural Appraisal (PRA) report.

It must be noted that your action should be focused and target oriented. There should be maximum involvement of the society, to achieve a sustainable solution.

Final report

At the end of the semester, students will submit a consolidated report of the project work to the department. The project report with plan of execution and output should be prepared and shared with the village/community. The report can include a short movie, pictures, statements and interview of the benefitted people.

Financial implications

As the project is associated with community welfare and may involve financial liabilities such as visiting the field areas, preparing some awareness programmes, survey reports and working projects etc. To meet the financial issues of the project course, the department may allocate a budget up to Rs. 50,000/- for the entire project course from the Professional Development Fund. A community van vehicle may be allocated for the successful implementation of the project.

Course Contents for Community Connect Project

UNIT I **Hours-8**

- Meaning, Definitions & Concepts of Community Connect Programme
- Natural Resource Management (NRM) & Livelihoods
- Water Conservation and Rain Water Harvesting
- Environmental Consciousness and Climate Change
- Sustainability and Traditional Knowledge Systems
- Village Communication Network
- ICT for Community Development

UNIT II **Hours-4**

- Governance & Local self-administration, PRIs, NGOs
- Constitutional Rights & Legal Entitlements
- Govt Policies and Schemes on Community Development
- Methods of Field Survey and Research, PRA
- Field Preparation

UNIT III **Hours-4**

- Case Studies related to Community Development, Success Stories

- Discussions on the Cases

UNIT IV **Hours-20**

- Field Visits, Community Surveys and Interventions
- Focus of the marginalized communities
- Survey based project work (Observation, Participation, Field visit, etc.)

UNIT V **Hours-4**

Report Preparation

***Topic for the survey or for project given by the concern faculty.**

Evaluation

The overall course will be for 200 marks (04 credits) divided as follows.

Mid Term Exam (40 Marks)

The midterm exam will be for 40 marks. In midterm exam student has to present progress of his work done to the concerned faculty member (s). In the presentation, the student should clearly state:

- Objectives of the project
- Questions based on the theory and action plan part of the project
- Community survey and identification of target community
- Plan of action with methodology of study
- Timeline for execution of the project

End Term Exam (120 Marks)

The final exam shall be of 120 marks in which student have to submit overall report and presentation before committee of examiners (including external examiner). Out of total 120 marks, the report preparation shall be of 30 marks, presentation for 30 marks and assessment of overall impact of the project for 60 marks.

Internal Assessment (40 Marks)

The internal assessment shall be for 40 marks and shall be accessed by concerned supervising faculty. The marks can be split into following categories:

- Attendance (in terms of number of hours spent in community): 10 Marks
- Action Plan and execution:10 Marks
- Devotion to the community service: 10 Marks
- Community connect and feedback: 10 Marks

Attendance

Students are required to have minimum of 75% attendance failing which student will not be allowed to appear in the examination.