Swami Keshvanand Institute of Technology,
Management &Gramothan

(An Autonomous Institute Affiliated to Rajasthan Technical University, Kota)
(Accredited by NAAC with 'A^{++}' Grade)
Approved by AICTE, Ministry of Education, Government of India
Recognized by UGC under Section 2(f) of the UGC Act, 1956

A brief report
on

Research Facilties at Department of Electronics & Communication Engineering

COE- Antenna, Microwave & RF Engineering
(Session- 2024-25)

: RAMNAGARIA (JAGATPURA), JAIPUR-302017 (RAJASTHAN), INDIA
: +91-141-3500300, 2752165,2752167, 2759609 | : 0141-2759555
info@skit.ac.in | : www.skit.ac.in

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1 General Information

Center Overview

The Centre of Excellence (CoE) for Antenna, Microwave and RF Engineering at SKIT Jaipur was established in May 2023 under the recognition and guidance of Rajasthan Technical University, Kota. It is dedicated to innovation, training, and research in wireless communication and electromagnetics, aiming to create industry-ready graduates, foster research excellence, and facilitate technology transfer.

Vision

To emerge as globally recognized centre for training, research and product innovation & development in the field of RF, antennas and microwave to meet the socio-economic needs.

Mission

To empower undergraduates and postgraduates by imparting quality training, research, collaborations with industries, product design & developments in the field of wireless communication and electromagnetic; and preparing them to be competent in dealing with industrial and societal challenges.

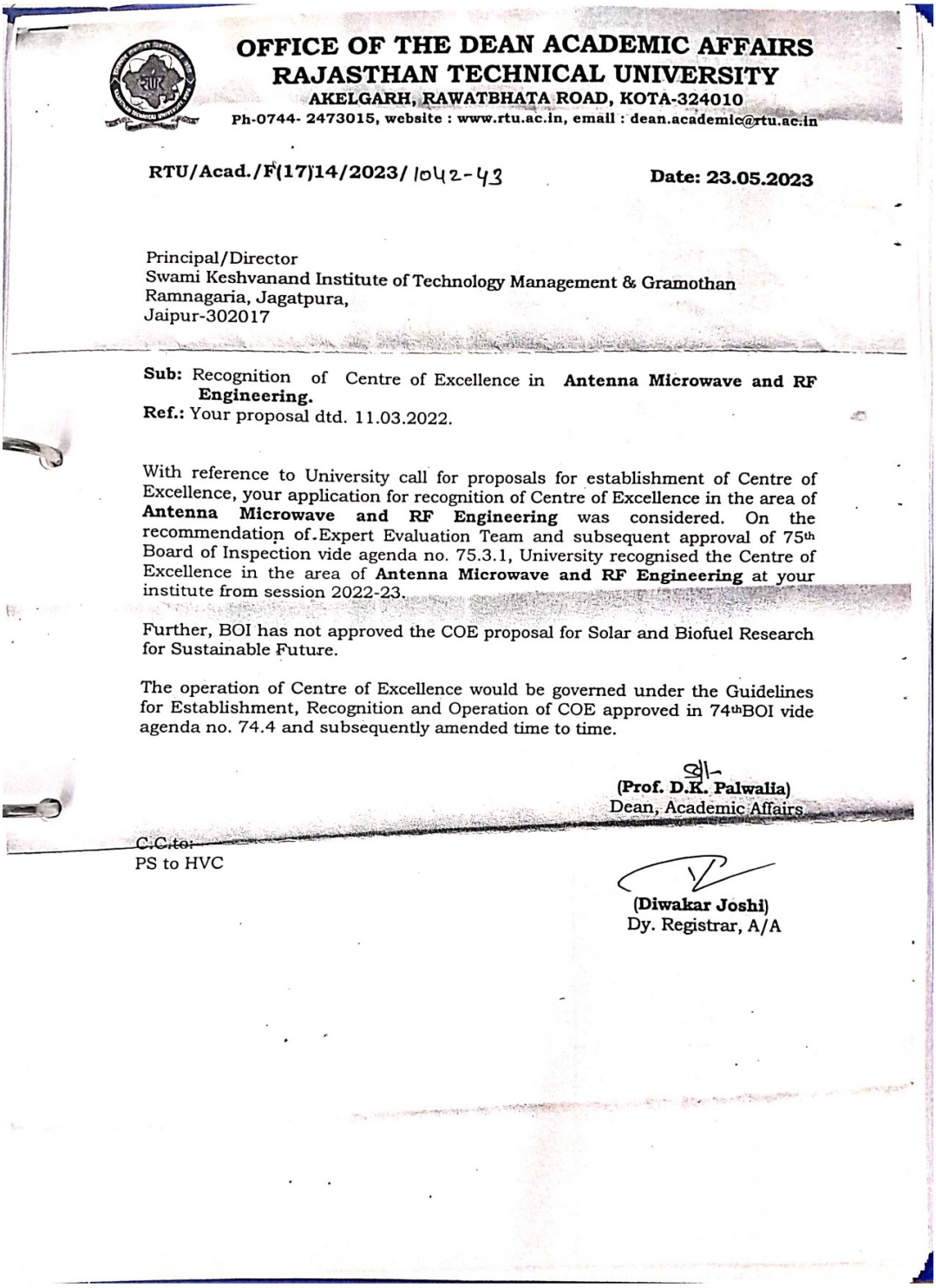
Objectives:

The CoE – "Antenna, Microwave and RF Engineering" is committed to achieving the following objectives:

1. Research Excellence: To conduct quality research that advances the frontiers of antenna, microwave, and RF engineering; addressing key challenges and driving innovation.
2. Education and Training: To provide quality education and training programs by involving experts and professionals in these fields.
3. Industry Collaboration: To collaborate with industries and Institutes, fostering the development of practical solutions and technologies with real-world applications.
4. Technology Transfer: To facilitate the transfer of knowledge and technology from our research endeavors to benefit society and industry.
5. Global Leadership: To establish this CoE as a global leader in antenna, microwave, and RF engineering; contributing to the growth and advancement in these fields.

History and Establishment

The CoE– Antenna, Microwave & RF Engineering was approved in May 2023



OFFICE OF THE DEAN ACADEMIC AFFAIRS
RAJASTHAN TECHNICAL UNIVERSITY
AKELGARH, RAWATBHATA ROAD, KOTA-324010
Ph-0744- 2473015, website : www.rtu.ac.in, email : dean.academic@rtu.ac.in

RTU/Acad./F(17)14/2023/ 1042-43 **Date: 23.05.2023**

Principal/Director
Swami Keshvanand Institute of Technology Management & Gramothan
Ramnagaria, Jagatpura,
Jaipur-302017

Sub: Recognition of Centre of Excellence in **Antenna Microwave and RF Engineering.**
Ref.: Your proposal dtd. 11.03.2022.

With reference to University call for proposals for establishment of Centre of Excellence, your application for recognition of Centre of Excellence in the area of **Antenna Microwave and RF Engineering** was considered. On the recommendation of Expert Evaluation Team and subsequent approval of 75th Board of Inspection vide agenda no. 75.3.1, University recognised the Centre of Excellence in the area of **Antenna Microwave and RF Engineering** at your institute from session 2022-23.

Further, BOI has not approved the COE proposal for Solar and Biofuel Research for Sustainable Future.

The operation of Centre of Excellence would be governed under the Guidelines for Establishment, Recognition and Operation of COE approved in 74thBOI vide agenda no. 74.4 and subsequently amended time to time.

(Prof. D.K. Palwalia)
Dean, Academic Affairs

C.C.to:
PS to HVC

(Diwakar Joshi)
Dy. Registrar, A/A

Leadership and Governance

S.N.	Name of mentor faculty	Designation	Qualification	Expertise details in Relevant COE	Experience (in years) (Teaching and Industry)
1	Prof.(Dr.) Mukesh Arora	Professor	B.E, M. Tech, Ph.D	Wireless communication and Antennas	20
2	Prof. (Dr.) Satish Kumar Bhatnagar	Professor & Director (Research)	Ph.D	Wireless communication and Antennas	50
3	Dr.Braj Raj Sharma	Professor and Head, Physics Department	M.Sc. (Physics), Ph.D.	Microstrip Patch Antennas	20
4	Dr. Monika Mathur	Professor & PG Co-ordinator	B.E, M. Tech, Ph.D	Microstrip antenna designing	17
5	Dr.Shubhi Jain	Associate Professor	B.E, M. Tech, Ph.D	Microstrip antennas, metamaterials	12
6	Dr.Komal Sharma	Associate Professor	M.Sc., Ph.D.	Microstrip Patch Antennas	22
7	Dr.Suman Sharma	Associate Professor	B.E, M. Tech, PGDBA, PhD	Wireless communication and Antennas	14
8	Dr.PallavRawal	Associate Professor	B.Tech., M. Tech, PhD	Reconfigurable Antennas	13

9	Ms. RajniIdiwal	Assistant Professor	B.E, M. Tech, PhD*	Optical antenna	13
10	Mr. Harshal Nigam	Assistant Professor	B.E, M. Tech, PhD*	Phased array antennas	9
11	Dr.Pawan Kumar Jain	Assistant Professor	M.Sc.,PhD*	Microwave Electronics, Microstrip Patch Antenna	18
12	Ms. Gloria Joseph	Assistant Professor	B.Tech., M. Tech	Photonics, optical antenna	12
13	Mr. Sunil Lakhawat	Assistant Professor	B.Tech., M. Tech	Digital communications	11
14	Mr. Dinesh kumar	Assistant Professor	B.E, M. Tech, PhD*	PCB designing and fabrication	14

S.No.	**Name of support staff**	**Designation**	**Qualification**	**Expertise details in Relevant COE**	**Total Experience (in years)**
1	Mr. Dhurendra Singh	Technical Assistant	B.Tech.	PCB designing, Software Handling	14
2	Mr. Prema Ram	Sr. Technical Assistant	B.Tech.	Project assistance, PCB designing and Software handling	14

2. Research Activities

Research Focus

The CoE-A,M& RF concentrates on a broad spectrum of high-impact research areas that align with current technological needs and future innovations in wireless communication. Key focus areas include the design, simulation, and development of microstrip patch antennas for various frequency bands such as S, C, X, and Ku bands, with a particular emphasis on 5G and upcoming 6G applications. The CoE actively explores reconfigurable and phased array antennas for enhanced signal directionality, gain, and bandwidth. Researchers at the center are working on metamaterial-based antennas, frequency-selective surfaces (FSS), defected ground structures (DGS), and dielectric resonator antennas (DRA) to improve antenna performance metrics. The center also focuses on the characterization and optimization of RF and microwave components, including filters, couplers, and power dividers. Another vital area of interest is the integration of Internet of Things (IoT) with RF modules, aiming at low-power, wide-area communication systems.

Research Facilities and Infrastructure

I. Major equipment's

S.No.	Name of Equipment	Specification	Year of purchase	Research Application	Total Cost (Rs.)
1	Vector Network Analyzer	Two port handheld VNA from Keysight technologies, Range is 14 GHz	2017	To analyze cables and antennas, field strength measurement, Spectrogram analysis and stimulus response Measurement of fabricated RF and Microwave	14,60,000

				components, Antenna parameters measurement	
2	5G VolTE smart phone training system	Supporting bands: 5G Sub 6 FDD, 5G Sub 6 TDD Networks, along with 4G LTE FDD, 4G LTE TDD, 3G WCDMA, 2G GSM. 6.6" Touch screen TFT LCD full HD.	2024	Study of 5G Smart phone and understanding 5G technology.	1,00,300
3	Automatic Spin Coating machine	Apex Instruments EZspin A1	2022	To deposit photo resist coating for fabrication on substrate	1,89,991

4	Spectrum Analyzer	Caddo 8010, 150 kHz to 1050 MHz	2009	It can be used for measurement of spectrum, Circuit testing, and troubleshooting	1,19,500
5	Proto Cure PCB Curing Machine (Oven)	Maximum allowable PCB size: 250 X 300 mm (10" X 12"), finned heaters with thermostat controls	2007	Table top unit for curing of liquid photoresist	12,375
6	Photoresist dip coating machine	Maximum allowable PCB size: 250 X 300 mm (10" X 12"), Rectangular tank 2 L capacity	2007	Coating of laminates with photoresist	19,923
7	PCB art work film maker	Working area: 250 X 300 mm (10" X 12")	2007	Negative making contact printer as well as an Illuminated art	15,675

		with diffused light		work table	
8	PCB double sided UV exposure machine	Maximum size: 250 X 300 mm (10" X 12"), UV tubes: 2X4= 8 Watts	2007	Double sided UV exposure	29,452
9	Microwave USB Power Sensor	Keysight U2000A 10 MHz-18 GHz	2018	To measure microwave power through various microstrip components	2,86,946

II. Major softwares

S.N	Name of Software	Research Application	Total Cost (Rs.)
1	Ansys Academic Teaching HF Package , Version 13,(25users)	To compute basic electromagnetic field quantities, Simulation of high frequency RF and microwave components along with antenna design simulation	9,00,000
2	MATLAB & Simulink R2006a	To simulate different algorithms related to transmission and reception of signals for communication system.	2,15,500

3	MW- 5G toolbox	5G Toolbox provides standard-compliant functions and reference examples for the modeling, simulation, and verification of 5G New Radio (NR) and 5G-Advanced communications systems. The toolbox supports link-level simulation, golden reference verification, conformance testing, and test waveform generation.	1,69,795
4	Lab View Academy standard suite z	It is used for microwave measurements in simplified manner with appropriate step by step explanations of instrument capabilities.	2,76,000

III. Other available infrastructure facilities

S.N	Description of the Infrastructure		Use in Research Center	Total
1	MT 9000	Micowave test bench (Klystron based)	Used for performing measurements of different Microwave parameters	4
2	MT 9001	Micowave test bench (Gunn based)	Used for performing measurements of different Microwave parameters	2
3	NV 9008	MIC Trainer kit	Contains different Microstrip components for measuring their characteristics	1
4	U2000A	Microwave Power sensor	To measure microwave power through various microstrip components	1
5	VS411	VSWR meter	To measure Microwave power and VSWR	2
6	Nvis104	Microwave generator S band	Microwave source to excite microstrip components	2
7	NV102	Klystron power supply	Microwave source for test bench	1
8	NV101A	Gunn power supply	Microwave source for test bench	2
9	HM 5012-2, 150 kHz to 1 GHz	Spectrum Analyzer	It can be used for measurement of spectrum, Circuit testing, and troubleshooting	1
10	Model No. 401-DSO-Scientech 50 MHz, 500 ms/s, Channel-2	DSO	Circuit testing, measurement and troubleshooting	2
11	1. Model No. HM1507-3, 150 MHz, 200 ms/s, Channel -2 (Analog and digital) 2. Keysight DSO 1012 A/ 100 MHz/ two channel	DSO	Circuit testing, measurement and troubleshooting	2

12	Digital microscope	Digital microscope	USB digital microscope magnifier	1
13	Caddo 803/Scientech ST251/ 30 MHz/ Two Channel	CRO	Circuit testing, measurement and troubleshooting	4
14	ScientiFic SM 5081	Milli ohm meter		3
15	ScientiFic SM 5051/ 1 GHz	Frequency counter		5
16	ScientiFic SM 5027	Distortion meter		1
17	Caddo 9302	Digital LCR meter		4
18	ScientiFic SM 5035/ 20 MHz	Pulse generator		1
19	ScientiFic SM 7022/metravi 19 F/Agilent U-1252 A	Digital Multimeter		14
20	ScientiFic SM 5070/caddo 4061/ 3 MHz	Function generator		3
21	VPL –VICT	Universal IC tester		1
22	TI	Project interfacing board	Designing and developing of electronics and embedded systems	5
23	Dynalog/NVIS NV 5001, NV 5002,	Microcontroller development board		6
24	ScientiFic SM 5015	Programmable multiplier		4
25	ScientiFic SM 901/ 30 MHz	Power scope		1
26	Scientech ST-4070, ST-4077	Power Supply		3
27	Scientech ST-2610	Project Board		5
28	TI/ AD58364M-EVM	ADC interfacing kit		1
29	TI	DAC interfacing kit		1
30	TI	GSM modem interface kit		1

IV. List of Consumables

S.N	Item	Quantity	Total Cost (Rs.)
1	Klystron tube 2k25 (2)	2	10400X2= 20800

2	Gunn diode tube (2)	2	10000X2=20000
3	RF Microwave amplifier BXHF1084 Bandwidth 2-20 GHz, high gain: 26dB (1)	1	9000
4	Microwave power detector (1)	1	8000
5	SMA M/M cable (10)	10	1000X10=10000
6	2.92(F) 2 Hole Connector, DC-40GHz	5	5310X5=26,550
7	SMA M/M connector (10)	10	1200X10=12000
8	SMA female connector (10)	10	1000X10=10000

3. Teaching and Education

Curriculum Development: Specialized modules on Antenna Design, Microwave Engineering, and 5G Communication integrated into the curriculum.

Student Training:

- 15 days and 45-day Summer Internship (July-September 2023)
- Hands-on sessions on RF, Antennas, and IoT
- Industrial and institutional visits

Faculty Development:

- FDPs, lecture series, and expert talks from global academia and industry

4. Outreach and Engagement

Community Partnerships:

- Jyoti Electronics, Ahmedabad
- Tesca Technologies Pvt. Ltd., Jaipur

5. Public Engagement and Knowledge Transfer:

- Internships
- Expert talks and student workshops
- International Conference

6. Future Plans and Vision

1. External R&D funding
2. Consultancy projects
3. Conduct advanced training on RF design and testing facility for researchers
4. Provide Internship for UG students in designing and testing antenna and RF devices
5. Enhance Research Publications and Patents