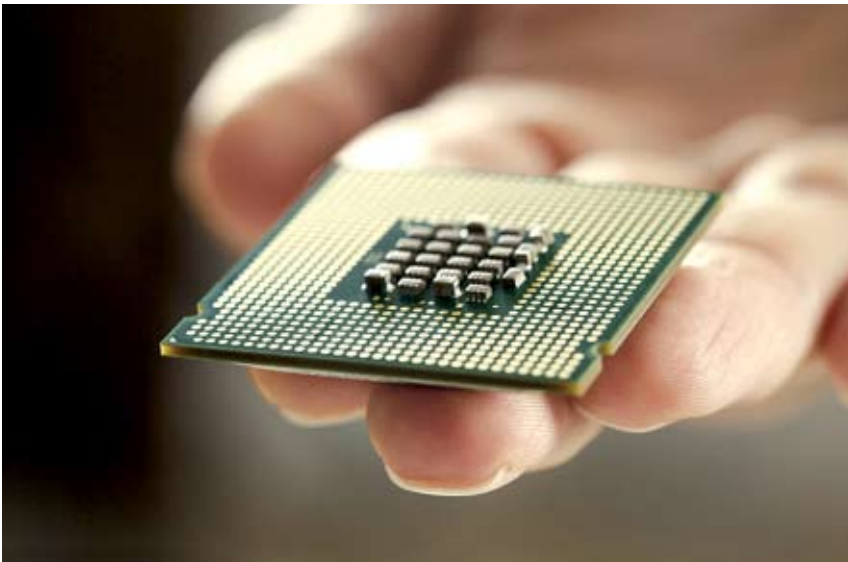


Get Embedded Right Away!

Embedded systems are a teamwork of hardware engineers, software engineers and application domain experts. You can find a place in any of these three broad categories



■ SUDESHNA DAS

They are omnipresent. They are there in your home, college, office, shopping mall and almost everywhere. Even when on the move—either on the most basic two-wheeler or on an advanced aircraft—you are still amidst embedded systems. But, have you ever thought of making a career in this exciting field? If not, here's why you should think about it!

Industry veterans like Renuka Krishna, associate vice president, recruitment, KPIT Cummins Info-systems, believes, "With the demand of smart and intelligent products by consumers, the content of electronics and thus embedded software is increasing significantly. This makes embedded software not only lucrative but a space that offers opportunities for out-of-the-box thinking. Career prospects for young talent trained in

this area are excellent."

Do you know the system?

"Embedded Systems are simply the brain of most electronic systems that access, process, store and control data," describes Niraj Patel, project chief, eIn-fochips. The embedded software industry can be classified into captive and non-captive units. The captive companies involve semiconductor companies that follow the IDM or fabless model and develop software that is required for chips and reference boards. OEMs also develop software for their own products. The non-captive companies are third-party embedded software developers, hardware/board designers or VLSI design companies that provide embedded software solutions as part of their service offerings. A few EMS and ODM companies also provide embedded software development services that are specific to the products

that they design and manufacture for clients.

"Apart from cost, access to a large pool of talent is the primary competitive advantage of India. Moreover, Indian design organisations are metamorphosing from labour cost arbitrage to becoming true contributors to product innovation. A growing phenomenon is that of companies either investing in new design operations in India or significantly expanding their existing facilities. This will contribute to further expansion of the talent pool and maturation of skill sets at Indian design companies, which will be a true differentiator in the long run," says Praveen K. Ganapathy, director-business development, Texas Instruments India.

Where do you fit?

Considering the increase in the number of design start-ups and key research and development contributions from India, the country is set to emerge as a major design centre for integrated circuits and embedded systems. Thus the demand for embedded system engineers for product and application development will continue to grow in the years to come.

Delve a little deeper, you will find that any embedded system is teamwork of three different sets of people: hardware engineers, software engineers and application domain experts. You can find a place in any of these broad categories.

As a hardware engineer, you will be responsible for hardware platform and module prototyping, debugging and testing. Additionally, you have to

ensure compliance with standards and product specifications and initiate design changes as per the requirement.

If you are comfortable with software, you can begin as an embedded system programmer. This role will engage you in activities like analysis and optimisation of embedded software for the targeted real-time operating system (RTOS). Your tasks may include developing installable and built-in device drivers, kernel modifications and embedded application.

If you would like to explore the application possibilities in the field, give a thought to becoming a protocol engineer. You will be assigned tasks like development, integration and testing of various protocols within an embedded firmware stack used in devices.

However, keep in mind that you are expected to be an industry-ready product. "There is a shortage of industry-ready talent in the embedded system field, which means industry-specific talent should be employed by imparting trainings to freshers," says Patel.

Who is hiring?

Almost all industries are increasing the use of embedded systems for increased sophistication in the areas of networking, automation and control. As a result, software, telecom and electronics companies are heavily diversifying into this field. The demand is maximum for professionals having 2-5 years of experience. Entry-level hiring is around 20 per cent of the total talent acquisition.

Most semiconductor manufacturers are involved in VLSI chip design and embedded software development. Indian companies are developing embedded products in consumer, industrial, telecom, automotive, computing and medical spaces, for local as well as foreign markets. Transnational global companies like Cisco, Juniper, Honeywell, GE, Bosch, Delphi, Visteon and Continental have set up their embedded development centres in India. In addition, semiconductor and design services companies in India like Wipro, HCL, Texas Instruments, Freescale,

Cadence, Mindtree, L&T, TCS, Tata Elxsi and KPIT Cummins are carrying out embedded software and hardware product development in India for global accounts.

Though the major recruiters are big players, you should also take into account the small and medium enterprises (SMEs). In fact, these are responsible for more than 50 per cent recruitment. Naveen Kumar, CEO, Emtech Foundation (an embedded system training institute), informs that SMEs are located in Delhi, Noida, Gurgaon, Pune, Bengaluru, Hyderabad, Chennai and even smaller cities like Nagpur, Mysore and Kanpur.

What's on offer?

Due to the huge gap between demand and supply of quality human resource, an experienced embedded system engineer may be the most sought-after

depends on the nature of organisation and competency level and academic background of the candidate. The ability to handle multitasking jobs may also be a defining factor.

After successful completion of the training period, an engineer's career graph grows from the junior level towards a project leader, project champion or project manager position. In addition to gaining technical expertise, it is always advisable to explore the business processes as that can accelerate the climb to the top.

Kumar opines that in an SME one can manage a growth of 20-30 per cent up to 100 per cent after gaining an experience of one or two years, depending on whether one decides to stick to the same firm or switch jobs. He also points out the many onsite opportunities that exist in USA, Europe, Singapore and Japan. You can explore

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professional in the electronics industry. "I believe salary is never a constraint for the right candidate. Typically, an embedded fresher starts at the same level as other engineers getting their first job in IT companies. However, embedded professionals are required to be more of solution seekers and providers. Due to these roles, they get to develop their skills faster and their rise on the corporate ladder too is faster," opines Krishna.

Let us check what is on offer. According to Patel, the average salary for a fresher in the embedded system field can range anywhere from Rs 10,000 to Rs 20,000 per month. Well-funded companies are prepared to offer upwards of Rs 25,000. Analysis of previous year's industry feedback reveals figures ranging between Rs 1.2 million and Rs 2 million per annum for candidates with four to five years of experience. The compensation

those after gaining experience of three to five years.

Know the trivia

So now you want to know the basic criteria for entry, isn't it? Diploma holders, engineering as well as science graduates and postgraduates, and even doctorates with background in electronics/electrical engineering or computer science may try their luck here. Primarily, embedded system development requires skills in electronics and computer science disciplines. The specific skills required are algorithms and programming, basic maths, computer organisation, electrical networks and digital circuits, control systems, digital signal processing (DSP) and basics of machine vision, real-time systems (including RTOS), programming of microprocessors and microcontrollers, and lab hardware.

"Depending upon the specialisa-

tion, one should focus on augmenting the skills required for embedded system development. For example, a person with electronics background should focus more on programming, software engineering and real-time system skills," explains Chandrakant Sakharwade, general manager, embedded division, DKOP Labs, from his vast experience as a trainer in this field.

Tips from the experts...

Your next question is likely to be "How to prepare myself for this niche field?" Let us ask the experts in this field.

Ajit Clarence, head, EFY Tech Center, Bengaluru, says, "As an embedded engineer, it is very important to have knowledge of hardware and software, which sets one apart from a normal software programmer. This is one reason why embedded engineers are paid more than normal software engineers."

From his varied experience in embedded industry and training, Clarence feels that the curriculum taught in various universities is more of theoretical in nature. Therefore he makes his students industry-ready by giving importance on hands-on training, both in hardware and software.

Clarence says that, an embedded engineer should have interest in basic electronics. He should have rigged up at least one circuit and tested it. He should be able to identify electronic components available in the market and know how to use them in his designs.

In fact, the challenge lies in understanding the electronics and other interface hardware. Understanding the fundamentals of embedded systems and knowledge of verification tools in an IDE setting are required.

Given that most electronic devices use microprocessors or microcontrollers, try to get in-depth knowledge of microcontrollers and printed circuit boards. "Programming, debugging and testing of microcontrollers as well as knowledge of printed circuit boards with respect to schematics and rout-

ing are must-to-have skills," informs Clarence.

Clarence also points out that electronic circuits (analogue designs) are very tricky, and you should be very observant and patient to avoid damage to the system that you design.

Kumar says that, the industry expects you to have super specialisations within the field, such as Embedded C programming, exploring controller-specific features under Embedded C, RTOS porting and application development, knowledge of special networking protocols, along with sound understanding of fundamentals like eight-bit microprocessors/microcontrollers, electronics hardware (basic, digital, analogue) and PCB designing.

Patel emphasises on the need of a broad approach to education as embedded systems encompass a wide range of applications, technologies and disciplines. He lays stress on the importance of 'C' language (as most of embedded work is based on it), small and single-microcontroller applications, control systems, distributed embedded control, system-on-chips, networking, embedded PCs, critical systems, robotics, computer peripherals, wireless data systems, signal processing, and command and control. Additional cross-enterprise skills that are important for embedded system designers include security, dependability, energy-aware computing, system engineering, real-time computing and human-computer interaction.

One should be able to think logically and learn to use real-time operating systems. Some of the advanced topics like VLSI, DSP and robotics need more knowledge of topics like analogue and digital designs, signal analysis and mechanical design, respectively.

The last frontier

It is possible that your awareness about most of the aforementioned terms is from a notional perspective only. The industry, however, needs something extra—the actual in-hand experience. Various private- and public-sector or-

ganisations absorb final-year and pre-final-year students in their live projects.

Patel informs, "At eInfochips, we recruit students at fresher level through campus placement wherein they start their eighth-semester industrial training. On an average, hiring happens at the entry level, in ASIC, embedded and software development divisions. As mentioned before, we provide technical and non-technical trainings to make freshers competent enough to work at eInfochips on customer projects either by owning a module or work with senior engineers."

Similarly, at KPIT Cummins, trainees spend initial 3-6 months on learning the core essentials and then move to roles of software engineer in the areas of electronic design and software development.

On the other hand, industry-academia partnership models like TI's 'University Relationship' and eInfochips' 'Impetus' are good endeavours to make students industry-ready.

Ganesh Guruswamy, vice president and country manager, Freescale Semiconductor, opines, "While embedded software companies are leveraging the growing availability of fresh engineering graduates, they must also spend considerable time and resources on training and boosting productivity. Currently, our universities offer limited exposure to real-world situations, and this poses a challenge when we hire fresh graduates. Increased industry participation in talent development will ensure industry-ready talent."

Become a go-getter

So dig out all possibilities to get a practical exposure. At the same time, keep abreast of the latest technological trends through newspapers, technical magazines, technical seminars and, last but not the least, trade fairs. You can learn about 'chip to ship' of an embedded system only after completing a proper project. ●

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