New Educational Policy Recommendation

Indian Institute of Artisans and Craftsmen

A proposal for revival of traditional Arts and Crafts of India

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Concept note for Indian Institute of Artisans and Craftsmen (IIA&C)

Introduction: Artisans and artisan-based social, economic and cultural systems have been the back bone of the Indian societal system (Bharathiya Samaj Vyavastha). The present time is perhaps the perfect time that we start working towards understanding this system and its socio-economic-cultural principles. We need to help devise such a lifestyle which is full of socio-economic-cultural values.

At the Indian Institute of Artisans and Craftsmen we will be designing courses for artisans and craftsmen to revive the old arts and crafts on which the society was depended upon. Artisans and Craftsmen will learn their trade along with cross integration of various disciplines. It will also be a platform for societal interventions.

Overview: The rural community and a very large extant the urban population too depends on Industries for many of their needs. But they need a lot of things to their specifications and due to lack of availability of skilled artisans and craftsmen they have to make do with the industry produce. Of the two the rural population is more dependent on the Artisans and Craftsmen and yet they have to heavily depend on the urban industries. The products made by the industries are mostly not suitable for the rural use yet they have to make do of the same. In the process the rural people incur losses and also difficulties in their life. The IIA&C has a vision to make the 'Make in India' dream of our PM into a reality by making in the villages whatever they need. This can be achieved by 'Make in Village' by producing skilled Artisans and Craftsmen.

We could blame it on the modern education or may be some kind of a social compulsion the traditional artisan communities are now withering away. Their children are all getting 'Educated' and they do not get back into their trade.

Keeping in view the above Indian Institute of Artisans and Craftsmen (IIA&C) is envisioned. The purpose is to revive the ancient traditional Artisan and Craftsman professions. The institutes can be started in the State Capitals at the beginning. These institutes are aimed in getting a vital, nationally competitive Rural Artisan & Craftsman community, engaged with and accountable to our society. These artisans and craftsmen will later go back to the villages and create a self sustained and self sufficient village.

1. Space for nurturing Artisans & Craftsmen: The rural populace especially the rural youth who remain uneducated or those who have dropped out of Secondary or Higher Secondary education are the target group. These IIA&Cs should be spaces for nurturing the communities of Artisans and Craftsmen.

a) Importance and relevance: About 150 years back our villages were totally self reliant and self sufficient. The village Artisans and Craftsmen were catering to the necessities of the people of the villages. Industrialisation and Modernisation has almost killed our ancient artisans and craftsmen. The Art and Craft that they practiced was much more eco-friendly as they did not cause such large scale pollution. The technology that was in use about 150 years back was small yet more eco-friendly. They used locally available Raw Material made things for the local people according to the needs of the local community.

b) Connecting society and the Artisans & Craftsmen: In ancient India every village was an economic unit, it was a tariff unit, it would never import of export anything and it would produce and consume all its needs. According to the needs of the local society the artisans and craftsmen designed their finished goods. Industrial standardisation in many cases has not been able to meet local needs. The local culture of 'Aadan-Pradan' was the connecting thread between the society and the Artisans and Craftsmen. IIA&C envisions bringing back this lost connection.

c) Creating a livelihood opportunity: Many of the rural youth having been educated do not find employment and they are politically abused or they become socially unfit. IIA&C will be a launching pad for creating more livelihood opportunities for these youth. Along with skills of the trade the

students will be taught entrepreneurship, financial planning and accounting; marketing etc. this will help the students to evolve into entrepreneurs.

d) Traditional Arts and Crafts are more eco-friendly: The Art and Craft that they practiced was much more eco-friendly as they did not cause such large scale pollution. The technology that was in use about 150 years back was small yet more eco-friendly. They used locally available Raw Material made things for the local people according to the needs of the local community. The effluent management was much easier as the units were micro-mini-units.

2. Various disciplines: The Village System or Gram Vyvastha was depended on a minimum of 12 to 52 Artisans and Craftsmen. These were called as Bavan-Baloothedar here the context need to be understood as the 52 bones of the backbone though the backbone has only 32 bones. Most of the 12 to 52 Artisan and Craftsmen are today almost extinct. The techniques and the crafts practiced by these people were very simple yet profound. It is the vision of IIA&C to ultimately revive all the lost arts and crafts. To start with the following disciplines (Trades) are suggested for the IIA&C.

1) Carpentry: Carpentry is a skilled trade in which the primary work performed on wood as a medium is the cutting, shaping and installation of building materials during the construction of buildings, ships, timber bridges, concrete formwork, etc. Carpentry is a noble trade that dates back centuries. Since the dawn of history, carpenters and woodworkers have built castles for kings, ships for merchants, and humble cabinets for blacksmiths and cobblers.

Carpenters traditionally worked with natural wood and did the rougher work such as framing, but today many other materials are also used and sometimes the finer trades of cabinetmaking and furniture building are considered carpentry. Today, skilled carpenters help build, upgrade and remodel buildings ranging from single-family homes to urban skyscrapers. As the craft's technology evolves, so do the educational needs of students hoping to enter the field. At IIA&C the students will learn the ancient art of carpentry with all the modern developments.

2) Black Smithy: A blacksmith is a metal-smith who creates objects from wrought iron or steel by forging the metal, using tools to hammer, bend, and cut. Blacksmiths produce objects such as gates, grilles, railings, light fixtures,

furniture, sculpture, tools, agricultural implements, decorative and religious items, cooking utensils and weapons.

While there are many people who work with metal such as farriers, wheelwrights, and armourers, the blacksmith had a general knowledge of how to make and repair many things, from the most complex of weapons and armour to simple things like nails or lengths of chain. At IIA&C the Students of Black Smithy will learn the ancient art of steel extraction to modern art of fabrication.

3) Pottery and Terracotta: The art of pottery is probably as old as human history. No other art traces the story of human beings on this earth as clearly as pottery does. The tides of time have washed away many civilisations but evidence of their existence remains in fragments of pottery. There are two reasons why this is true: the first is that clay is found in abundance in practically all parts of the world; the second is that clay objects are the least perishable of all materials. The Pottery and Terracotta course envisages to teach the fine art as practiced by the ancient potters and also imbibe the modern techniques.

4) Brick, Stone and Lime Mortar Masonry: Mortar is a workable paste used to bind building blocks such as stones, bricks, and concrete masonry units together, fill and seal the irregular gaps between them, and sometimes add decorative colors or patterns in masonry walls. In its broadest sense mortar includes pitch, asphalt, and soft mud or clay, such as used between mud bricks. *Mortar* comes from Latin *mortarium* meaning crushed.

It would be problematic to use Portland cement mortars to repair older buildings originally constructed using lime mortar. Lime mortar is softer than cement mortar, allowing brickwork a certain degree of flexibility to adapt to shifting ground or other changing conditions. Cement mortar is harder and allows little flexibility. The contrast can cause brickwork to crack where the two mortars are present in a single wall.

Lime mortar is considered breathable in that it will allow moisture to freely move through and evaporate from the surface. In old buildings with walls that shift over time, cracks can be found which allow rain water into the structure. The lime mortar allows this moisture to escape through evaporation and keeps the wall dry. Re−pointing or rendering an old wall with cement mortar stops

the evaporation and can cause problems associated with moisture behind the cement. The ancient art of using Lime Mortar is almost a dying art. At IIA&C we plan to revive this fine art.

5) Bamboo and Cane craft: People practicing Bamboo and Cane craft were belonging to the Hindu Burud Caste Burud. *Burud* is derived from a Sanskrit word "Buruda". *Buruda* in Sanskrit means "a basket-maker, mat-maker". People of this caste are recognized by their traditional occupation of bamboo craft. In the old days, Buruds (people belonging to the Burud Caste) were dependent on bamboo craft for their livelihood. They use bamboo to prepare different articles like mats, ladders, baskets. With increase in population and growing popularity of plastic/metallic articles, bamboo-based livelihood is no more viable. This has in turn led to the younger generation taking up other occupations for livelihood.

Bamboos are the fastest-growing plants in the world, due to a unique rhizome-dependent system. Certain species of bamboo can grow 91 cm (3 ft) within a 24-hour period, at a rate of almost 4 cm (1.5 in) an hour (a growth around 1 mm every 90 seconds, or one inch every 40 minutes). Bamboos are of notable economic and cultural significance in South Asia, Southeast Asia and East Asia, being used for building materials, as a food source, and as a versatile raw product. Bamboo has a higher compressive strength than wood, brick, or concrete and a tensile strength that rivals steel. At IIA&C we want to bring back this eco-friendly trade to its ancient glory.

6) Metal Casting: Metal casting involves pouring liquid metal into a mould, which contains a hollow cavity of the desired shape, and then allowing it to cool and solidify. The solidified part is also known as a casting, which is ejected or broken out of the mould to complete the process. Casting is most often used for making complex shapes that would be difficult or uneconomical to make by other methods. Casting processes have been known for thousands of years, and widely used for sculpture, especially in bronze, jewellery in precious metals, and weapons and tools. Traditional techniques include lost-wax casting, plaster mould casting and sand casting.

The modern casting process is subdivided into two main categories: expendable and non-expendable casting. It is further broken down by the

mould material, such as sand or metal, and pouring method, such as gravity, vacuum, or low pressure.

The Metal Casting course at IIA&C is aimed to fuse the ancient fine art with the technologies of the modern.

7) Stone Carving: Stone carving is an ancient activity where pieces of rough natural stone are shaped by the controlled removal of stone. Owing to the permanence of the material, stone work has survived which was created during our prehistory. Work carried out by paleolithic societies to create flint tools is more often referred to as knapping. Stone carving that is done to produce lettering is more often referred to as lettering. The process of removing stone from the earth is called mining or quarrying.

The term Stone carving is one of the processes which may be used by an artist when creating a sculpture. The term also refers to the activity of masons in dressing stone blocks for use in architecture, building or civil engineering. It is also a phrase used by archaeologists, historians, and anthropologists to describe the activity involved in making some types of petroglyphs. At IIA&C the course in Stone Carving will include the 'Shilpa Shastra' of the ancient and the tools of the modern world.

8) Cold-press oil extraction: The oil is obtained through pressing and grinding fruit or seeds with the use of heavy granite millstones. Although pressing and grinding produces heat through friction, the temperature must not rise above 120°F (49°C) for any oil to be considered cold pressed. Cold pressed oils retain all of their flavor, aroma, and nutritional value. Olive, peanut and sunflower are among the oils that are obtained through cold pressing.

The Stone – Log Oil Extractor (Ghanna) has been a part of every village in India. The people India used only cold press oils till the oil mills happened. At IIA&C we plan to revive the Ghanna extraction of oil and also the modern slow extractions which also do cold press extraction.

9) Handloom textile: Along with the artistry of weavers, the Indian handloom industry demonstrates the richness and diversity of Indian culture. The handloom industry is the second-largest employment provider for the rural population in India after agriculture. Indian handloom products are known for

their unique designs and finesse. The trend is to mix old designs with new techniques and create original products. The industry has strong infrastructure, with about 2.4 million looms of varied designs and construction, indicating significant production capacity. The local design of each region makes Indian Handloom industry very unique. At IIA&C the impetus will be on the conservation of local design and also to evolve modern computer aided design.

10) Brass, Copper and Bronze vessel making: There was a community by the name 'Khasaar' in India they made vessels out of iron, brass, bronze, etc. They would make vessels by joining plates of various metals and alloys. They would also do sand casting for some of the vessels too. Modern industry especially the steel industry is the main reason for the down fall of these vessels. Research has proved that cooking in these vessels is healthier than Steel, Aluminium or Hindallium. There is an urgent need to revive this ancient healthy craft of making vessels. At IIA&C we plan to revive this ancient art of vessel making.

11) Natural Dye and Colour making: Natural dyes are dyes or colorants derived from plants, invertebrates, or minerals. The majority of natural dyes are vegetable dyes from plant sources—roots, berries, bark, leaves, and wood—and other organic sources such as fungi and lichens

Archaeologists have found evidence of textile dyeing dating back to the Neolithic period. In China, dyeing with plants, barks and insects has been traced back more than 5,000 years.[1] The essential process of dyeing changed little over time. Typically, the dye material is put in a pot of water and then the textiles to be dyed are added to the pot, which is heated and stirred until the color is transferred. Textile fibre may be dyed before spinning ("dyed in the wool"), but most textiles are "yarn-dyed" or "piece-dyed" after weaving. Many natural dyes require the use of chemicals called mordants to bind the dye to the textile fibres; tannin from oak galls, salt, natural alum, vinegar, and ammonia from stale urine were used by early dyers. Many mordants, and some dyes themselves, produce strong odours, and large-scale dye-works were often isolated in their own districts.

12) Jute craft: Jute is a long, soft, shiny vegetable fibre that can be spun into coarse, strong threads. It is produced from plants in the genus *Corchorus*,

which was once classified with the family Tiliaceae, more recently with Malvaceae, and has now been reclassified as belonging to the family Sparrmanniaceae. The primary source of the fibre is *Corchorus olitorius*, but it is considered inferior to *Corchorus capsularis*. "Jute" is the name of the plant or fiber that is used to make burlap, Hessian or gunny cloth. The word 'jute' is probably coined from the word jhuta or jota, an Oriya word.

Jute is one of the most affordable natural fibres and is second only to cotton in amount produced and variety of uses of vegetable fibres. Jute fibres are composed primarily of the plant materials cellulose and lignin. It falls into the bast fibre category (fibre collected from bast, the phloem of the plant, sometimes called the "skin") along with kenaf, industrial hemp, flax (linen), ramie, etc. The industrial term for jute fiber is *raw jute*. The fibers are off-white to brown, and 1–4 metres (3–13 feet) long. Jute is also called the *golden fibre* for its colour and high cash value.

13) Paper Making: Paper making has been an ancient art in India. The artisans who made paper were called ‘Kagji’ or ‘Kagzi’ coming from the word ‘Kagaj’ meaning paper. Organically produced handmade paper has a very long life compared to the machine made chemically treated one. The difference is like if the chemically treated machine made paper lasts 60 years the organic handmade one lasts about 600 years. The art of making paper includes pulping, planing, drying and pressing. Then the paper is rolled in calendaring method. At IIA&C the students will learn the ancient organic handmade paper making along with machine made paper also to know the difference and are so that they come to know the difference between them.

14) Doll and Toy making: Various types of toys were made by the artisans depending upon the needs and the growth of the child. All the toys were non-toxic and child friendly. The usage of fast growing soft wood was rampant for 2reasons. One the wood was soft, fast growing, and most of the times these plants would be planted as fencing plants and the fencing would be renewed from time-to-time. Non toxic substances like ‘Lappa’ with organic colours were used for most of the toys. At IIA&C the students will learn the ancient art of making child-friendly and non-toxic toys for the child.

The training module for each of the above trades will include the following.

a) A brief history of the trade both the Indian and world context.

b) Tools and implements used

i) Handling tools

ii) How to make them or get them made

iii) Servicing and maintenance

c) Raw Material

i) How to harvest

ii) When to harvest (The astrological connection)

iii) How to use

iv) How to conserve

v) Waste material management

vi) Other usages of the raw material like medicinal etc. (Ayurvedic connection)

d) Designing

i) Design and usage

ii) Design and Aesthetics

iii) Technical aspects like Proportion, Symmetry and Balance etc.

iv) Brief History of design in the Indian and world context

e) Production

i) Raw material management at production site

ii) Production line management

iii) Quality assurance

iv) Finishing and Packaging

Common Subjects for all trades.

1. Accountancy and Book Keeping

2. Costing

3. Financial planning and management

4. Marketing

i) Positioning

ii) Outreach

iii) Visibility

iv) Availability

v) Customer retention

vi) Supply chain management and demand – supply management

vii) Competitor activity

viii) Post sale customer service

5. Entrepreneurship

6. Waste and effluents management

7. Cross integration of various disciplines

1. Annexure 1 contains syllabus for Accountancy, Bookkeeping and Financial Management

2. Annexure 2 contains content for Marketing

3. Annexure 3 contains content for Entrepreneurship

4. Annexure 4 contains content for Carpentry trade

5. Annexure 5 contains content for Black Smithy trade

6. Annexure 6 Contains content for Pottery and Terracotta

7. Annexure 7 contains content for Cold Press Oil Extraction

Content for other trades can be developed at a later stage in consultation with subject experts on the same lines as the above trades.

Annexure 1 - Accountancy, Book Keeping, Financial Planning and Financial Management.

1. Accountancy: Accounting or accountancy is the measurement, processing and communication of financial information about economic entities. The modern field was established by the Italian mathematician Luca Pacioli in 1494. Accounting, which has been called the "language of business", measures the results of an organization's economic activities and conveys this information to a variety of users, including investors, creditors, management, and regulators. Practitioners of accounting are known as accountants. The terms 'accounting' and 'financial reporting' are often used as synonyms.

Accounting can be divided into several fields including financial accounting, management accounting, auditing, and tax accounting. Accounting information systems are designed to support accounting functions and related activities. Financial accounting focuses on the reporting of an organization's financial information, including the preparation of financial statements, to external users of the information, such as investors, regulators and suppliers; and management accounting focuses on the measurement, analysis and reporting of information for internal use by management. The recording of financial transactions, so that summaries of the financials may be presented in financial reports, is known as bookkeeping, of which double-entry bookkeeping is the most common system.

Accounting is facilitated by accounting organizations such as standard-setters, accounting firms and professional bodies. Financial statements are usually audited by accounting firms, and are prepared in accordance with generally accepted accounting principles (GAAP). GAAP is set by various standard-setting organizations such as the Financial Accounting Standards Board (FASB) in the United States and the Financial Reporting Council in the United Kingdom. As of 2012, "all major economies" have plans to converge towards or adopt the International Financial Reporting Standards (IFRS).

2. Financial accounting

Financial accounting focuses on the reporting of an organization's financial information to external users of the information, such as investors, regulators and suppliers. It calculates and records business transactions and prepares financial statements for the external users in accordance with generally accepted accounting principles (GAAP). GAAP, in turn, arises from the wide agreement between accounting theory and practice, and change over time to meet the needs of decision-makers.

Financial accounting produces past-oriented reports—for example the financial statements prepared in 2006 reports on performance in 2005—on an annual or quarterly basis, generally about the organization as a whole.

This branch of accounting is also studied as part of the board exams for qualifying as an actuary. It is interesting to note that these two professionals, accountants and actuaries, have created a culture of being arch rivals.

3. Management accounting: Management accounting focuses on the measurement, analysis and reporting of information that can help managers in making decisions to fulfil the goals of an organization. In management accounting, internal measures and reports are based on cost-benefit analysis, and are not required to follow the generally accepted accounting principle (GAAP). In 2014 CIMA created the Global Management Accounting Principles (GMAPs). The result of research from across 20 countries in five continents, the principles aim to guide best practice in the discipline.

Management accounting produces future-oriented reports—for example the budget for 2006 is prepared in 2005—and the time span of reports varies widely. Such reports may include both financial and non financial information, and may, for example, focus on specific products and departments.

4. Auditing: Auditing is the verification of assertions made by others regarding a payoff, and in the context of accounting it is the "unbiased examination and evaluation of the financial statements of an organization".

An audit of financial statements aims to express or disclaim an opinion on the financial statements. The auditor expresses an opinion on the fairness with which the financial statements presents the financial position, results of

operations, and cash flows of an entity, in accordance with the generally acceptable accounting principle (GAAP) and "in all material respects". An auditor is also required to identify circumstances in which the generally acceptable accounting principles (GAAP) has not been consistently observed.

5. Tax accounting: Tax accounting in the United States concentrates on the preparation, analysis and presentation of tax payments and tax returns. The Indian tax system requires the use of specialised accounting principles for tax purposes which can differ from the generally accepted accounting principles (GAAP) for financial reporting. Indian tax law covers four basic forms of business ownership: sole proprietorship, partnership, corporation, and limited liability company. Corporate and personal income are taxed at different rates, both varying according to income levels and including varying marginal rates (taxed on each additional dollar of income) and average rates (set as a percentage of overall income).

6. Bookkeeping: Bookkeeping is the recording of financial transactions, and is part of the process of accounting in business. Transactions include purchases, sales, receipts, and payments by an individual person or an organization/corporation. There are several standard methods of bookkeeping, such as the single-entry bookkeeping system and the double-entry bookkeeping system, but, while they may be thought of as "real" bookkeeping, any process that involves the recording of financial transactions is a bookkeeping process.

Bookkeeping is usually performed by a **bookkeeper**. A bookkeeper (or book-keeper) is a person who records the day-to-day financial transactions of a business. He or she is usually responsible for writing the *daybooks*, which contain records of purchases, sales, receipts, and payments. The bookkeeper is responsible for ensuring that all transactions are recorded in the correct daybook, supplier's ledger, customer ledger, and general ledger; an accountant can then create reports from the information concerning the financial transactions recorded by the bookkeeper.

The bookkeeper brings the books to the trial balance stage: an accountant may prepare the income statement and balance sheet using the trial balance and ledgers prepared by the bookkeeper.

Finally financial statements are drawn from the trial balance, which may include:

- the income statement, also known as the *statement of financial results*, *profit and loss account*, or *P&L*
- the balance sheet, also known as the *statement of financial position*
- the cash flow statement
- the statement of retained earnings, also known as the *statement of total recognised gains and losses* or *statement of changes in equity*

i) Single-entry system

The primary bookkeeping record in single-entry bookkeeping is the *cash book*, which is similar to a checking account (UK: cheque account, current account) register, but allocates the income and expenses to various income and expense accounts. Separate account records are maintained for petty cash, accounts payable and receivable, and other relevant transactions such as inventory and travel expenses. These days, single-entry bookkeeping can be done with DIY bookkeeping software to speed up manual calculations.

ii) Double-entry system

A *double-entry bookkeeping system* is a set of rules for recording financial information in a financial accounting system in which every transaction or event changes at least two different nominal ledger accounts.

iii) Daybooks: A *daybook* is a descriptive and chronological (diary-like) record of day-to-day financial transactions also called a *book of original entry*. The daybook's details must be entered formally into journals to enable posting to ledgers. Daybooks include:

- Sales daybook, for recording all the sales invoices.
- Sales credits daybook, for recording all the sales credit notes.
- Purchases daybook, for recording all the purchase invoices.
- Purchases Debits daybook, for recording all the purchase Debit notes.
- Cash daybook, usually known as the cash book, for recording all money received as well as money paid out. It may be split into two daybooks: receipts daybook for money received in, and payments daybook for money paid out.

- General Journal daybook, for recording journals.

iv) Petty cash book

A *petty cash* book is a record of small-value purchases before they are later transferred to the ledger and final accounts; it is maintained by a petty or junior cashier. This type of cash book usually uses the imprest system: a certain amount of money is provided to the petty cashier by the senior cashier. This money is to cater for minor expenditures (hospitality, minor stationery, casual postage, and so on) and is reimbursed periodically on satisfactory explanation of how it was spent.

MORE DETAILING CAN BE MADE AT A LATER STAGE

7. Costing:

8. Financial planning and management (Including banking services, NABARD, CAPART, SIDBI, IDBI etc.) Financial planning is the task of determining how a business will afford to achieve its strategic goals and objectives. Usually, a company creates a Financial Plan immediately after the vision and objectives have been set. The Financial Plan describes each of the activities, resources, equipment and materials that are needed to achieve these objectives, as well as the timeframes involved.

The Financial Planning activity involves the following tasks;

- Assess the business environment
- Confirm the business vision and objectives
- Identify the types of resources needed to achieve these objectives
- Quantify the amount of resource (labor, equipment, materials)
- Calculate the total cost of each type of resource
- Summarize the costs to create a budget
- Identify any risks and issues with the budget set

Performing Financial Planning is critical to the success of any organization. It provides the Business Plan with rigor, by confirming that the objectives set are achievable from a financial point of view. It also helps the CEO to set financial targets for the organization, and reward staff for meeting objectives within the budget set.

The role of financial planning includes three categories:

1. Strategic role of financial management
2. Objectives of financial management
3. The planning cycle

When drafting a financial plan, the company should establish the **planning horizon**, which is the time period of the plan, whether it be on a short-term (usually 12 months) or long-term (2–5 years) basis. Also, the individual projects and investment proposals of each operational unit within the company should be totaled and treated as one large project. This process is called **aggregation**.

MORE DETAILING CAN BE MADE AT A LATER STAGE

Annexure 2 – Marketing

a) Basic Marketing: Marketing is a form of communication between you and your customers with the goal of selling your product or service to them. Communicating the value of your product or service is a key aspect of marketing.

b) Positioning: Positioning is a marketing strategy that aims to make a brand occupy a distinct position, relative to competing brands, in the mind of the customer.

c) Outreach: Is to reach further than or the extent or length of reaching out.

d) Outreach marketing: aims to take marketing back to its roots and focuses on a human to human connection and the basics of consumer psychology. It's a philosophy that aims to fix the damage and confusion that all of the buzzwords have caused and bring marketing back to a simple level and the fact that it's as simple as connection *with* your consumers instead of a process of marketing *at* them.

If we develop a strategy that looks to how humans have always wanted to learn about and hear about new things, our marketing and digital PR will be so much better for it.

Here are the nine principals of outreach marketing that will help you create passionate word of mouth recommendations for your brand.

1. People are wired to trust a third party recommendation more than someone talking about themselves. Whether it's a guy at a cocktail party trying to promote himself for a date or a brand trying to convince a consumer that they are the best—it's all the same.

Actionable Tip: Reach out to bloggers who write about the niche your brand falls in to and ask if they want to do a product review. Send them something for free, don't require a post and see if it elicits an authentic mention in a post.

2. Outreach marketing is all about reaching out to the right people at the right time to help you tell your brand's story. This can include anyone from individuals with a large social presence who fit snugly within your brand's niche to the uber happy consumer who takes it upon herself to tell everyone how much she loves your product.

Actionable Tip: Picture your brand with a sphere around it. Inside of your brand sphere, are a ton of people interacting with, talking about or fit in with your brand in some form or another. Make sure you have a way of identifying who is already talking about your brand and communicate with all of them.

3. A giant piece of outreach marketing is bringing consumers and people who love your brand in to your brand instead of treating them like an extension of your brand.

Actionable Tip: Have a list of your biggest brand fans and make sure you keep in communication with them. Email them updates and ask for their opinions. Periodically send them free t-shirts and brand products. Want to take it a step further? Send them something on their birthdays!

4. Outreach marketing ditches the campaign model (in the traditional sense of the words) and embraces ongoing relationships and owning those relationships instead of outsourcing marketing and PR efforts for a "one and done" strategy.

Actionable Tip: Reach out to new people who have an affinity for your brand but focus just as much time, if not more, on the people you already have that love your brand and foster those relationships.

5. This type of marketing has a strong focus on authenticity and relevance as opposed to number of followers and numerical qualifiers. Things like SEO, rank, social presence and followers all fall in to place as a result of authentic marketing and brand recommendations.

Actionable Tip: When finding new people to reach out to don't focus only on reach look at their content, how much they engage with their audience and how authentic their posts are.

6. Outreach marketing involves a quest for the creative ways and people to tell your brand's story. It looks outside the box to all sorts of people with different perspectives.

Actionable Tip: Interview an employee of your brand who has nothing to do with marketing. Write a fun story about the CEO or interview the farmer who grows the produce you use in your desserts or the fashion designer who makes your jeans.

7. Outreach marketing is about real relationships. Which, put simply, is taking in to careful consideration mutually beneficial relationships. Meaning marketers take care of their advocates and influencers and don't hesitate to incentivize and reward them for their help.

Actionable Tip: Don't let a brand shout out go unnoticed. Whether you send a package in the mail or you thank them on Twitter.

8. Outreach marketing takes in to consideration strategies that span the entire digital realm and non-digital world where people still have conversations about brand and products. When implementing a digital strategy, outreach marketing involves a plan that embraces multiple channels through one person. What is called as the one – to – one – to many concept.

Actionable Tip: Bloggers are a great springboard because they can be searched for contextually and more information can be gathered from a blog which makes for an easier and more effective pitching process.

9. Outreach marketing embraces the fact that we live in a grey world and marketing is no exception. This strategy hesitates to draw black and white lines and follow sets of rules.

Actionable Tip: Trust your gut and if something feels right for your strategy even though you read somewhere "not to ever do xy or z" do it anyway and see what happens!

e) Visibility:

f) Availability:

f) Customer retention: The easiest way to grow your customers is not to lose them

The average business loses around 20 percent of its customers annually simply by failing to attend to customer relationships. In some industries this leakage is as high as 80 percent. The cost, in either case, is staggering, but few businesses truly understand the implications.

Imagine two businesses, one that retains 90 percent of its customers, the other retaining 80 percent. If both add new customers at the rate of 20 percent per year, the first will have a 10 percent net growth in customers per year, while the other will have none. Over seven years, the first firm will virtually double, while the second will have no real growth. Everything else being equal, that 10-percent advantage in customer retention will result in a doubling of customers every seven years without doing anything else.

The consequences of customer retention also compound over time, and in sometimes unexpected ways. Even a tiny change in customer retention can cascade through a business system and multiply over time. The resulting effect on long-term profit and growth shouldn't be underestimated.

Marketing Wisdom can introduce you to a number of simple customer retention strategies that will cost you little or nothing to implement. Behind each technique listed here there is an in-depth step-by-step process that will increase your customer retention significantly once implemented, and will have a massive impact on your business.

1. Reducing Attrition

Virtually every business loses some customers, but few ever measure or recognise how many of their customers become inactive. Most businesses, ironically, invest an enormous amount of time, effort and expense building that initial customer relationship. Then they let that relationship go unattended, in some cases even losing interest as soon as the sale been made, or even worse, they abandon the customer as soon as an easily remedied problem occurs, only to have to spend another small fortune to replace that customer. The easiest way to grow your business is not to lose your customers.

Once you stop the leakage, it's often possible to double or triple your growth rate because you're no longer forced to make up lost ground just to stand still.

2. Sell and then sell again

So many people do an excellent job of making the initial sale, then drop the ball and get complacent, ignoring the customer, while they chase more business. Your selling has actually only just begun when someone makes that initial purchase decision because virtually everyone is susceptible to buyer's remorse. To lock in that sale, and all of the referrals and repeat business that will flow from it, you need to strike while the iron is hot to allay your customers' fears and demonstrate by your actions that you really care. You should thank them and remind them again why they've made the right decision to deal with you … and put a system in place to sell to them again, and again, constantly proving that they made the right decision.

3. Bring back the "lost sheep"

There's little point in dedicating massive resources to generating new customers when 25-60% of your dormant customers will be receptive to your attempts to regenerate their business if you approach them the right way, with the right offer. Reactivating customers who already know you and your product is one of the easiest, quickest ways to increase your revenues. Re-contacting and reminding them of your existence, finding out why they're no longer buying, overcoming their objections and demonstrating that you still value and respect them will usually result in a tremendous bounty of sales and drastically increased revenues in a matter of days … and will lead to some of your best and most loyal customers.

4. Frequent Communications Calendar

Avoid losing your customers by building relationships and keeping in touch using a rolling calendar of communications. This is a programmed sequence of letters, events, phone calls, "thank you's", special offers, follow-ups, magic moments, and cards or notes with a personal touch etc. that occur constantly and automatically at defined points in the pre-sales, sales and post-sales process. People not only respond to this positively, they really appreciate it because they feel valued and important. It acknowledges them, keeps them

informed, offsets post-purchase doubts, reinforces the reason they're doing business with you and makes them feel part of your business so that they want to come back again and again.

5. Extraordinary Customer Service

The never-ending pursuit of excellence to keep customers so satisfied that they tell others how well they were treated when doing business with you. Moving the product or service you deliver into the realm of the extraordinary by delivering higher than expected levels of service to each and every customer. Key facets include: dedication to customer satisfaction by every employee; providing immediate response; no buck passing; going above and beyond the call of duty; consistent on-time delivery; delivering what you promise before AND after the sale; a zero-defects and error-free-delivery process and recruiting outstanding people to deliver your customer service. Extraordinary service builds fortunes in repeat customers, whereas poor service will drive your customers to your competition.

6. Courtesy system

A powerful system that improves the interpersonal skills of your team and changes the spirit of your organisation. It involves speaking to colleagues politely and pleasantly, without sarcasm or parody, and treating them at least as well as you would want them to treat your customers. This will help your team to feel worthwhile and important, which makes for pleasant social contacts at work. It also motivates them to provide extraordinary service, encourages them to be consistently pleasant in all of their dealings and to relate to customers in a warm, human and natural manner. This results in better, warmer, stronger, more trusting relationships and longer term bonds with your customers.

7. Product or service integrity

Long-term success and customer retention belongs to those who do not take ethical shortcuts. There must always be total consistency between what you

say and do and what your customer's experience. The design, build quality, reliability and serviceability of your product or service must be of the standard your customers want, need and expect. Service integrity is also demonstrated by the way you handle the small things, as well as the large. Customers will be attracted to you if you are open and honest with them, care for them, take a genuine interest in them, don't let them down and practice what you preach … and they will avoid you if you don't.

8. Measure lifetime value

There's a vast difference between the one-off profit you might make on an average sale, which ignores the bigger picture, and the total aggregate profit your average customer represents over the lifetime of their business relationship with you. Once you recognise how much combined profit a customer represents to your business when they purchase from you again and again, over the months, years or decades, you'll realise the critical importance of taking good care of your customers. And because you'll understand just how much time, effort and expense you can afford to invest in retaining that customer, you'll be in control of your marketing expenditure.

9. A complaint is a gift

96 percent of dissatisfied customers don't complain. They just walk away, and you'll never know why. That's because they often don't know how to complain, or can't be bothered, or are too frightened, or don't believe it'll make any difference. Whilst they may not tell you what's wrong, they will certainly tell plenty of others. A system for unearthing complaints can therefore be the lifeblood of your business, because customers who complain are giving you a gift, they're still talking to you, they're giving you another opportunity to return them to a state of satisfaction and delight them and the manner in which you respond gives you another chance to show what you're made of and create even greater customer loyalty.

Other customer retention strategies include:

1. Blogs
2. CRM Systems

3. Loyalty Programs
4. Magic Moments
5. Overcome Buyers Remorse
6. Personal Touches
7. Premiums and Gifts
8. Questionnaires and Surveys
9. Regular Reviews
10. Social Media
11. Welcome Book

g) Supply chain management and demand – supply management: The **marketing supply chain** is the chain of suppliers that an organization relies on to produce marketing materials (print, promotional products and point of sale) to market their products and services.

The marketing supply chain is often made up of partners inside and outside of the organization – such as brand managers, marketing services, agencies, direct sales teams, buyers, printers, fulfillment houses and many others.

From product brochures and promotional flyers to point-of-sale systems and store signage, each of these supplies must be acquired, managed and distributed to customers, sales teams, branch offices, retail outlets, dealers, distributors and other key audiences around the world.

Similar to manufacturing environments, marketing supply chains are primarily governed by a process or "flow" that typically involves:

- Creation – identifying and developing marketing materials to meet customer need and/or to support sales initiatives,
- Production – getting materials in their final form either through sourcing, printing or Web development,
- Warehousing – technology, storage strategy, planning,

- Fulfillment – order management, service standards, shipping and tracking use/consumption – how materials are used and displayed in the field and stored based on seasonality or product/service availability,
- Feedback – collecting information for continuous refinement; from inventory reporting, management metrics, field/customer feedback.

h) Competitor activity:

g) Post sale customer service:

h) Traditional Marketing: Traditionally, the producer and the consumer being the village, there was a definitive market for the producer, the market being the people of the village. The system of Aadan-Pradaan or 'Give & Take' was the marketing principle for the producer and consumer. ('Give & Take' is a very poor substitute for Aadan-Pradaan.) We need to understand this system by understanding the sacraments and the festivals of India which have largely contributed for the Socio-Economic-Cultural fabric of the country.

MORE DETAILING CAN BE MADE AT A LATER STAGE

Annexure 3 – Entrepreneurship

(Khadhi Gramodyog board, govt and private boards promoting indigenous trades)

Waste and effluents management:

Cross integration of various disciplines:

MORE DETAILING CAN BE MADE AT A LATER STAGE

Annexure 4 – Carpentry

Overview:

At the School of Artisans and Craftsmen, you can prepare yourself to meet the demands of 21st century carpentry. The Carpentry program can teach blueprint reading, structural framing with wood and metal, stair construction, and window, door, countertop and cabinet installation. Students will have the opportunity to hone basic math skills while learning to become proficient with common hand and power tools.

Other areas of study **include reading and drawing plans, learning to estimate and schedule jobs, stair building, floor installations** and much more. Through hands-on training, you'll learn basic design principles like framing, interior and exterior finishing and layout. Many carpenters acquire their skills by participating and graduating from an apprenticeship program at a school. Certificate and associate's degree programs in carpentry are offered by the School of Artisans and Craftsmen. The college represent some of the best programs available in the field.

In addition to hands-on carpentry training, students learn about relevant safety and health regulations. Field experience opportunities are typically included in each program's curriculum, allowing students the chance to **work under a professional carpenter**. Read on for more information about program curricula and classes required, as well as skills gained through these programs in carpentry. Students will learn in a professional-level workshop using a variety of hand and power tools. Instructors will be professional carpenters with years of real-world experience. Upon graduation, you'll be qualified to work as an apprentice carpenter for contractors in most metropolitan areas.

GENERAL INFORMATION

1. Name of the Course: Carpentry Training.
2. Duration of Training :
1 Year (Two semesters each of six months duration). Craftsmen training
2 Year (Four semesters each of six months duration). Diploma
3 Year (Six semesters each of six months duration). Graduation

3. Subject covered: TRADE THEORY & TRADE PRACTICAL

4. Applicability: CARPENTRY TRADE

5. Examination: To be held at the end of each semester.
6. Space Norms:
(a) One class room of minimum 30 sq.m. area having Minimum width of 5 m. and with 6000 lumen
(b) Workshop : 120 sq. meter having minimum width of 8 m. and with 30000 lumen
The electrical equipments of Class room should conform to minimum 3 star Building energy rating per Bureau of Energy Efficiency (B.E.E.)
7. Power Norms: (a) 1 KW for Class room
(b) 10 KW for Workshop
8. Unit strength (Batch Size): 20 Trainees
9. Entry qualification :
(a) 8th standard pass for 1 Year (Two semesters each of six months duration). Craftsmen training, 210 working days.
(b) 10th Standard pass for 2 Year (Four semesters each of six months duration). Diploma, 420 working days.
(c) 12th Standard or Pre-University or Pre-Degree pass for 3 Year (Six semesters each of six months duration). Graduation, 630 working days.

a) A brief history of carpentry in both the Indian and world context.

Carpentry is a skilled trade in which the primary work performed on wood as a medium is the cutting, shaping and installation of building materials during the construction of buildings, ships, timber bridges,

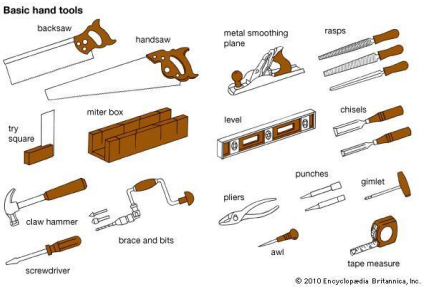
concrete formwork, etc. Carpentry is a noble trade that dates back centuries. Since the dawn of history, carpenters and woodworkers have built castles for kings, ships for merchants, and humble cabinets for blacksmiths and cobblers.

Carpenters traditionally worked with natural wood and did the rougher work such as framing, but today many other materials are also used and sometimes the finer trades of cabinetmaking and furniture building are considered carpentry. Today, skilled carpenters help build, upgrade and remodel buildings ranging from single-family homes to urban skyscrapers. As the craft's technology evolves, so do the educational needs of students hoping to enter the field.

MORE DETAILING CAN BE MADE AT A LATER STAGE

b) Tools and implements used

i) Handling tools, Hand tools and power tools



Hand tools: Axe, Saw (*Aari*), Hacksaw, Big saw for making planks (*Badi Aari*), Fretsaw, Vice, Hand Drill (*Burma*), Lathe (*Jantar*), Hammer (*Hathoda)*, Chisel (*Patasi*), *Barshi* Instrument used to peel bark from the wood, Smoothening plane (*Runda*), Gimlet, Punch, Pliers (*Chimta*), Screwdrivers, Sprit level, Set square, Measuring tape, Rule, Sand paper, Compass (*Prakar*).

Power tools:

1. **Circular Saw**

While some people consider the circular saw to be more of a carpentry tool than a fine woodworking tool, I would tend to disagree. There may be no more versatile basic handheld power tool than a circular saw. When used with a clamp-on straight-edge, the circular saw can be just about as accurate as a table saw and handle quite a few of the tasks that one would attempt with a table saw, particularly cutting sheet goods such as plywood or medium-density fibre board. When woodworking on a budget, a quality circular saw should be the first handheld power tool purchased, as it is the one that will likely be the most useful as you get started.

2. Power Drill Some might expect to see a cordless drill on this list, but when we're talking about basic power woodworking tools, a corded drill is more versatile and powerful. Sure, the cordless is, well, cordless, which makes it more portable, but corded drills are less expensive and can do more than a cordless drill. There are some options to consider when choosing a corded power drill, such as whether you want a 3/8-inch or 1/2-inch chuck, keyed or keyless chuck, straight drill or hammer drill, and so on. Learn all about these options (along with some suggestions on what to look for when shopping) in this article on corded power drills.

ii) How to make them or get them made

iii) Servicing and maintenance

MORE DETAILING CAN BE MADE AT A LATER STAGE

c) Raw Material

Raw materials used: Wood (*Lakdi*), horn of animals like cows, buffaloes, etc. (*Seengh*), aluminium panels, plywood, particle boards, Falxseed oil (*Alsi* ka tel) for polishing, Turpentine oil, *Luppa* for filling gaps in wood, glues and plasters.

Different kinds of timber used:

- *Chirman* wood for handles for all the instruments
- Soft wood for making combs
- *Panas* (Jackfruit), *Neem* or *Sagwan* (Teak) would for making main doors and the entrance door
- *Jamun* (Rose apple) wood for making cups for drinking water
- *Sagwan* (Teak) wood for cage and barrels for storing liquor
- *Babool* wood for making ploughs, potters' wheels, irrigation whets, etc.
- Ply Wood for making cabinets etc.
- Glue and Plaster.

i) How to harvest wood: The maturity of the wood is the main criterion for harvesting the wood. At the same time there are certain times of the year when the wood should not be harvested as the wood can easily catch mites. The chopping down of trees should be done in a proper way such that there is minimum wastage.

ii) When to harvest (The astrological connection): There are certain times of the year when the wood should not be harvested as the wood can easily catch mites. There are certain 'Nakshatras' (Asterisms) of the day and the day of the week which matters. If the wood is harvested during these times the wood will rot soon and also will catch mites.

iii) How to use

iv) How to conserve

v) Waste material management

vi) Other usages of the raw material like medicinal etc. (Ayurvedic connection)

MORE DETAILING CAN BE MADE AT A LATER STAGE

d) Designing

i) Design and usage: The product must be designed according to the usage of the customer. The positioning of the product can be made better when the usage has been properly defined.

ii) Design and Aesthetics: Aesthetics is an important part of design. Regionally India has various designs of furniture, door frames, window frames etc. according to the architecture of that region. These things have to be kept in mind while designing the respective product.

iii) Technical aspects like Proportion: Proportion exists in forms; the size of each section must relate to the size of other sections in order to maintain balance and unity. Symmetry and Balance are other two elements to be considered in design.

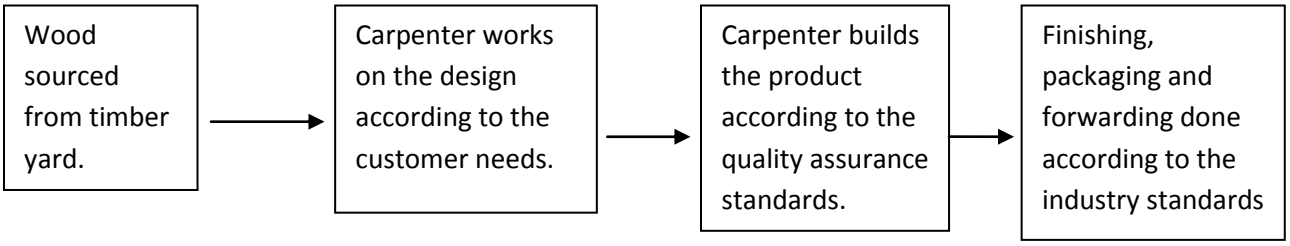
iv) Brief History of design in the Indian and world context:

MORE DETAILING CAN BE MADE AT A LATER STAGE

e) Production:

i) Raw material management at production site:

ii) Production line management



iii) Quality assurance

iv) Safety measures

v) Finishing and Packaging

MORE DETAILING CAN BE MADE AT A LATER STAGE

Sl. No.	Subject	Details	No. of hours	No. of hours	No. of hours

			CPT-CT101	CPT-D101	CPT-B101
1.	Introduction Orientation & Overview		6 hours	6 hours	6hours
2.	History	Brief history in the Indian and world context.			
3.	Tools	1. Hand Tools 2. Power Tools 3. How to use 4. How to make 5. How to service and maintain			
4.	Raw Material	1. List of Raw Materials discussed 2. How to harvest 3. When to harvest 4. Conservation 5. Waste material management 6. Other usages			
5.	Designing	1. Design and usage			

		2. Design and aesthetics 3. Proportion, symmetry and balance 4. History of design			
6.	Production	1. Raw material management 2. Production line management 3. Safety measures 4. Finishing and packaging 5. Quality assurance			
7.	Marketing	1. Positioning 2. Outreach 3. Visibility 4. Availability 5. SCM & DSM			
8.	Post sale customer service				
9.	Waste and Effluent management				

10.	**Entrepreneurship**				
11.	**Accountancy**	**1. General accounting** **2. Financial Accounting** **3. Management accounting** **4. Auditing** **5.Tax Accounting**			
12.	**Book Keeping**	**1. General book keeping** **2. Single entry** **3. Double entry** **4. Day Book** **5. Petty Cash**			
13.	**Costing**				
14.	**Financial planning and management**				
15.	**Cross integration of various disciplines**				
	Total no of hours		**1050 hours**	**2100 hours**	**3150 hours**

Annexure 5 – Black Smithy

Overview:

A **blacksmith** is a metal-smith who creates objects from wrought iron or steel by forging the metal, using tools to hammer, bend, and cut (cf. whitesmith). Blacksmiths produce objects such as gates, grilles, railings, light fixtures, furniture, sculpture, tools, agricultural implements, decorative and religious items, cooking utensils and weapons.

While there are many people who work with metal such as farriers, wheelwrights, and armourers, the blacksmith had a general knowledge of how to make and repair many things, from the most complex of weapons and armour to simple things like nails or lengths of chain.

The "black" in "blacksmith" refers to the black fire scale, a layer of oxides that forms on the surface of the metal during heating. The origin of "smith" is debated, it may come from the old English word "smythe" meaning "to strike" or it may have originated from the Proto-German "smithaz" meaning "skilled worker."

GENERAL INFORMATION

1. Name of the Course: Blacksmith Training.

2. Duration of Training :

1 Year (Two semesters each of six months duration). Craftsmen training

2 Year (Four semesters each of six months duration). Diploma

3 Year (Six semesters each of six months duration). Graduation

3. Subject covered: TRADE THEORY & TRADE PRACTICAL

4. Applicability: Blacksmith Trade

5. Examination: To be held at the end of each semester.

6. Space Norms:

(a) One class room of minimum 30 sq.m. area having Minimum width of 5 m. and with 6000 lumen

(b) Workshop : 120 sq. meter having minimum width of 8 m. and with 30000 lumen

The electrical equipments of Class room should conform to minimum 3 star Building energy rating per Bureau of Energy Efficiency (B.E.E.)

7. Power Norms: (a) 1 KW for Class room

(b) 10 KW for Workshop

8. Unit strength (Batch Size): 20 Trainees

9. Entry qualification :

(a) 8th standard pass for 1 Year (Two semesters each of six months duration). Craftsmen training, 210 working days.

(b) 10th Standard pass for 2 Year (Four semesters each of six months duration). Diploma, 420 working days.

(c) 12th Standard or Pre-University or Pre-Degree pass for 3 Year (Six semesters each of six months duration). Graduation, 630 working days.

a) A brief history of carpentry in both the Indian and world context.

In Hindu mythology, Tvastar also known as Vishvakarma is the blacksmith of the devas. The earliest references of Tvastar can be found in the Rigveda.

Hephaestus (Latin: Vulcan) was the blacksmith of the gods in Greek and Roman mythology. A supremely skilled artisan whose forge was a volcano; he constructed most of the weapons of the gods, as well as beautiful assistants for his smithy and a metal fishing-net of astonishing intricacy. He was the god of metalworking, fire, and craftsmen.

In Celtic mythology, the role of Smith is held by eponymous (their names do mean 'smith') characters : Goibhniu (Irish myths of the Tuatha Dé Danann cycle) or Gofannon (Welsh myths/ the Mabinogion)

The Anglo-Saxon Wayland Smith, known in Old Norse as Völundr, is a heroic blacksmith in Germanic mythology. The Poetic Edda states that he forged beautiful gold rings with wonderful gems. He was captured by king Níðuðr, who cruelly hamstringed him and imprisoned him on an island. Völundr eventually had his revenge by killing Níðuðr's sons and forging objects to the king from their skulls, teeth and eyes. He then seduced the king's daughter and escaped laughing on wings he himself had forged.

Seppo Ilmarinen, the Eternal Hammerer, blacksmith and inventor in the Kalevala, is an archetypal artificer from Finnish mythology.

Tubal-Cain is mentioned in the book of Genesis of the Torah as the original smith.

Ogun, the god of iron, is one of the pantheons of "orisa" traditionally worshipped by the Yoruba of Nigeria.

Before the Iron Age

Gold, silver, and copper all occur in nature in their native states, as reasonably pure metals - humans probably worked these metals first. These metals are all quite malleable, and humans' initial development of hammering techniques was undoubtedly applied to these metals.

During the Chalcolithic era and the Bronze Age, humans in the Mideast learned how to smelt, melt, cast, rivet, and (to a limited extent) forge copper and bronze. Bronze is an alloy of copper and approximately 10% to 20% Tin. Bronze is superior to just copper, by being harder, being more resistant to corrosion, and by having a lower melting point (thereby requiring less fuel to melt and cast). Much of the copper used by the Mediterranean World came from the island of Cyprus. Most of the tin came from the Cornwall region of the island of Great Britain, transported by sea-borne Phoenician and Greek traders.

Copper and bronze cannot be hardened by heat-treatment, they can only be hardened by work-hardening. To accomplish this, a piece of bronze is lightly hammered for a long period of time. The localized stress-cycling causes the necessary crystalline changes. The hardened bronze can then be ground to sharpen it to make edged tools.

Clocksmiths as recently as the 19th century used work hardening techniques to harden the teeth of brass gears and ratchets. Tapping on just the teeth produced harder teeth, with superior wear-resistance. By contrast, the rest of the gear was left in a softer and tougher state, more capable of resisting cracking.

Bronze is sufficiently corrosion-resistant that artifacts of bronze may last thousands of years relatively unscathed. Accordingly, museums frequently preserve more examples of Bronze Age metal-work than examples of artifacts from the much younger Iron Age. Buried iron artifacts may completely rust away in less than 100 years. Examples of ancient iron work still extant are very much the exception to the norm.

Iron Age

Concurrent with the advent of alphabetic characters in the Iron Age, humans became aware of the metal iron. In earlier ages, iron's qualities, in contrast to those of bronze, were not generally understood though. Iron artifacts, composed of meteoric iron, have the chemical composition containing up to 40% nickel. As this source of this iron is extremely rare and fortuitous, little development of smithing skills peculiar to iron can be assumed to have occurred. That we still possess any such artifacts of meteoric iron may be ascribed to the vagaries of climate, and the increased corrosion-resistance conferred on iron by the presence of nickel.

During the (north) Polar Exploration of the early 20th century, Inughuit, northern Greenlandic Inuit, were found to be making iron knives from two particularly large nickel-iron meteors.[6] One of these meteors was taken to Washington, D.C., where it was remitted to the custody of the Smithsonian Institution.

The Hittites of Anatolia first discovered or developed the smelting of iron ores around 1500 BC. They seem to have maintained a near monopoly on the knowledge of iron production for several hundred years, but when their empire collapsed during the Eastern Mediterranean upheavals around 1200 BC, the knowledge seems to have escaped in all directions.

In the Iliad of Homer (describing the Trojan War and Bronze Age Greek and Trojan warriors), most of the armor and weapons (swords and spears) are stated to have been of bronze. Iron is not unknown, however, as arrowheads are described as iron, and a "ball of iron" is listed as a prize awarded for winning a competition. The events described probably occurred around 1200 BC, but Homer is thought to have composed this epic poem around 700 BC; so exactitude must remain suspect.

When historical records resume after the 1200 BC upheavals and the ensuing Greek Dark Age, iron work (and presumably blacksmiths) seem to have sprung like Athena, fully-grown from the head of Zeus. Very few artifacts remain, due to loss from corrosion, and re-use of iron as a valuable commodity. What information exists indicates that all of the basic operations of blacksmithing were in use as soon as the Iron Age reached a particular locality. The scarcity of records and artifacts, and the rapidity of the switch from Bronze Age to Iron Age, is a reason to use evidence of bronze smithing to infer about the early development of blacksmithing.

Despite being subject to rust, iron replaced bronze as soon as iron-wielding hordes could invade Bronze Age societies and literally slice through their obsolete bronze defenses. Iron is a stronger and tougher metal than bronze, and iron ores are found nearly everywhere. Copper and Tin deposits, by contrast, are scattered and few, and expensive to exploit.

Iron is different from most other materials (including bronze), in that it does not immediately go from a solid to a liquid at its melting point. H_2O is a solid (ice) at -1 C (31 F), and a liquid (water) at +1 C (33 F). Iron, by contrast, is definitely a solid at 800 °F (427 °C), but over the next 1,500 °F (820 °C) it becomes increasingly plastic and more "taffy-like" as its temperature increases. This extreme temperature range of variable solidity is the fundamental material property upon which blacksmithing practice depends.

Another major difference between bronze and iron fabrication techniques is that bronze *can* be melted. The melting point of iron is much higher than that of bronze. In the western (Europe & the Mideast) tradition, the technology to make fires hot enough to melt iron did not arise until the 16th century, when smelting operations grew large enough to require overly large bellows. These

produced blast-furnace temperatures high enough to melt partially refined ores, resulting in *cast iron*. Thus cast iron frying pans and cookware did not become possible in Europe until 3000 years after the introduction of iron smelting. China, in a separate developmental tradition, was producing cast iron at least 1000 years before this.

Although iron is quite abundant, good quality steel remained rare and expensive until the industrial developments of Bessemer process *et al.* in the 1850s. Close examination of blacksmith-made antique tools clearly shows where small pieces of steel were forge-welded into iron to provide the hardened steel cutting edges of tools (notably in axes, adzes, chisels, etc.). The re-use of quality steel is another reason for the lack of artifacts.

The Romans (who ensured that their own weapons were made with good steel) noted (in the 4th century BC) that the Celts of the Po River Valley had iron, but not good steel. The Romans record that during battle, their Celtic opponents could only swing their swords two or three times before having to step on their swords to straighten them.

On the Indian subcontinent, Wootz steel was, and continues to be, produced in small quantities.

In southern Asia and western Africa, blacksmiths form endogenous castes that sometimes speak distinct languages.

In the medieval period, blacksmithing was considered part of the set of *seven mechanical arts*.

Prior to the industrial revolution, a "village smithy" was a staple of every town. Factories and mass-production reduced the demand for blacksmith-made tools and hardware.

The original fuel for forge fires was charcoal. Coal did not begin to replace charcoal until the forests of first Britain (during the AD 17th century), and then the eastern United States of America (during the 19th century) were largely depleted. Coal *can be* an inferior fuel for blacksmithing, because much of the world's coal is contaminated with sulfur. Sulfur contamination of iron and steel make them "red short", so that at red heat they become "crumbly" instead of

"plastic". Coal sold and purchased for blacksmithing should be largely free of sulfur.

European blacksmiths before and through the medieval era spent a great deal of time heating and hammering iron before forging it into finished articles. Although they were unaware of the chemical basis, they were aware that the quality of the iron was thus improved. From a scientific point of view, the reducing atmosphere of the forge was both removing oxygen (rust), and soaking more carbon into the iron, thereby developing increasingly higher grades of steel as the process was continued.

Industrial era

During the eighteenth century, agents for the Sheffield cutlery industry scoured the British country-side, offering new carriage springs for old. Springs must be made of hardened steel. At this time, the processes for making steel produced an extremely variable product—quality was not ensured at the initial point of sale. Springs that had survived cracking through hard use over the rough roads of the time, had proven to be of a steel of better quality. Much of the fame of Sheffield cutlery (knives, shears, etc.) was due to the extreme lengths the companies took to ensure they used high-grade steel.

During the first half of the nineteenth century, the US government included in their treaties with many Native American tribes, that the US would employ blacksmiths and strikers at Army forts, with the expressed purpose of providing Native Americans with iron tools and repair services.

During the early to mid-nineteenth century, both European armies as well as both the U.S. Federal and Confederate armies employed blacksmiths to shoe horses and repair equipment such as wagons, horse tack, and artillery equipment. These smiths primarily worked at a traveling forge that when combined with a limber, comprised wagons specifically designed and constructed as blacksmith shops on wheels to carry the essential equipment necessary for their work.

Lathes, patterned largely on their woodturning counterparts, had been used by some blacksmiths since the middle-ages. During the 1790s Henry Maudslay created the first screw-cutting lathe, a watershed event that signaled the start

of blacksmiths being replaced by machinists in factories for the hardware needs of the populace.

Samuel Colt neither invented nor perfected interchangeable parts, but his insistence (and other industrialists at this time) that his firearms be manufactured with this property, was another step towards the obsolescence of metal-working artisans and blacksmiths. (See also Eli Whitney).

As demand for their products declined, many more blacksmiths augmented their incomes by taking in work shoeing horses. A shoer-of-horses was historically known as a farrier in English. With the introduction of automobiles, the number of blacksmiths continued to decrease, many former blacksmiths becoming the initial generation of automobile Mechanics. The nadir of blacksmithing in the United States was reached during the 1960s, when most of the former blacksmiths had left the trade, and few if any new people were entering the trade. By this time, most of the working blacksmiths were those performing farrier work, so the term *blacksmith* was effectively co-opted by the farrier trade.

20th century

During the 20th century various gases (natural gas, acetylene, etc.) have also come to be used as fuels for blacksmithing. While these are fine for blacksmithing iron, special care must be taken when using them to blacksmith steel. Each time a piece of steel is heated, there is a tendency for the carbon content to leave the steel (decarburization). This can leave a piece of steel with an effective layer of unhardenable iron on its surface. In a traditional charcoal or coal forge, the fuel is really just carbon. In a properly regulated charcoal/coal fire, the air in and immediately around the fire should be a reducing atmosphere. In this case, and at elevated temperatures, there is a tendency for vaporized carbon to soak *into* steel and iron, counteracting or negating the decarburizing tendency. This is similar to the process by which a **case** of steel is developed on a piece of iron in preparation for case hardening.

A renewed interest in blacksmithing occurred as part of the trend in "do-it-yourself" and "self-sufficiency" that occurred during the 1970s. Currently there are many books, organizations and individuals working to help educate the public about blacksmithing, including local groups of smiths who have formed

clubs, with some of those smiths demonstrating at historical sites and living history events. Some modern blacksmiths who produce decorative metalwork refer to themselves as artist-blacksmiths. In 1973 the Artists Blacksmiths' Association of North America was formed with 27 members. By 2013 it had almost 4000 members. Likewise the British Artist Blacksmiths Association was created in 1978, with 30 charter members and had 2013 about 600 members and publish for members a quarterly magazine.

While developed nations saw a decline and re-awakening of interest in blacksmithing, in many developing nations blacksmiths continued doing what blacksmiths have been doing for 3500 years: making and repairing iron and steel tools and hardware for people in their local area.

b) Tools and implements used

i) Handling tools, Hand tools and power tools

Hand Tools and implements used: Iron Anvil on Iron base for shaping implements, plier to hold hot iron (*Chimta*), Hammer (*Hathodi*), Sledge Hammer (*Ghan*), Chisel (*Ulli/patasi*), Bellows (*Titthi*), Punch to bore holes (*Pogur*), compass (*Kavaram/prakar*), Sprit level, Rule, Set Squares, Vice, wrench,

An **anvil** is a block with a hard surface on which another object is struck. The block is as massive as is practical, because the higher the inertia of the anvil, the more efficiently it causes the energy of the striking tool to be transferred to the work piece. On a quality anvil the smith's hammer should rebound with almost as much energy as the smith put into the downward stroke, making the smith's job easier. In most cases the anvil is used as a forging tool. Before the advent of modern welding technology, it was a primary tool of metal workers.

The great majority of modern anvils are made of cast or forged steel that has been heat treated. Inexpensive anvils have been made of cast iron and low quality steel, but are considered unsuitable for serious use as they deform and lack rebound when struck.

Because anvils are very ancient tools and were at one time very commonplace, they have acquired symbolic meaning beyond their use as utilitarian objects.

Power tools: Grinding machine, Milling Machine, Lathe, Drilling Machine,

ii) How to make them or get them made

iii) Servicing and maintenance

MORE DETAILING CAN BE MADE AT A LATER STAGE

c) Raw Material

Raw materials used: Iron (*Loha*) in sheet form, rods, lumps, nuggets, ribbons, Copper (*tamba*), Borax (*suhaga*), Coal (*Koyla*), wrought iron, mild steel, cast iron,

i) How to harvest iron: The Earth's *crust* contains metals and metal *compounds* such as gold, iron oxide and aluminium oxide, but when found in the Earth these are often mixed with other substances. To become useful, the metals have to be extracted from whatever they are mixed with. A **metal ore** is a rock containing a metal, or a metal compound, in high enough concentration to make it economic to extract the metal.

Ores are mined. They may need to be concentrated before the metal is extracted and purified. The economics of using a particular ore may change over time. For example, as a metal becomes rarer, an ore may be used when it was previously considered too expensive to mine.

ii) When to extract: Extraction of the Ore should be in conjunction with conducive Astrological time periods. (example: During Karthika Maasa, Iron Ore is not extracted.)

iii) How to use: Concentrating the ore: Getting rid of as much of the unwanted rocky material as possible before the ore is converted into the metal.

In some cases this is done chemically. For example, pure aluminium oxide is obtained from bauxite by a process involving a reaction with sodium hydroxide solution.

Some copper ores can be converted into copper(II) sulphate solution by leaving the crushed ore in contact with dilute sulphuric acid for a long time. Copper can then be extracted from the copper(II) sulphate solution.

But, in many cases, it is possible to separate the metal compound from unwanted rocky material by physical means. A common example of this involves ***froth flotation***.

When iron ore is smelted into usable metal, a certain amount of carbon is usually alloyed with the iron. (Charcoal is almost pure carbon.) The amount of carbon significantly affects the properties of the metal. If the carbon content is over 2%, the metal is called cast iron, because it has a relatively low melting point and is easily cast. It is quite brittle, however, and cannot be forged so therefore not used for blacksmithing. If the carbon content is between 0.25% and 2%, the resulting metal is tool grade steel, which can be heat treated as discussed above. When the carbon content is below 0.25%, the metal is either "wrought iron (wrought iron is not smelted and cannot come from this process) " or "mild steel." The terms are never interchangeable. In preindustrial times, the material of choice for blacksmiths was wrought iron. This iron had a very low carbon content, and also included up to 5% of glassy iron silicate slag in the form of numerous very fine stringers. This slag content made the iron very tough, gave it considerable resistance to rusting, and allowed it to be more easily "forge welded," a process in which the blacksmith permanently joins two pieces of iron, or a piece of iron and a piece of steel, by heating them nearly to a white heat and hammering them together. Forge welding is more difficult with modern mild steel, because it welds in a narrower temperature band. The fibrous nature of wrought iron required knowledge and skill to properly form any tool which would be subject to stress. Modern steel is produced using either the blast furnace or arc furnaces.

Wrought iron was produced by a labor-intensive process called *puddling*, so this material is now a difficult-to-find specialty product. Modern blacksmiths generally substitute mild steel for making objects traditionally of wrought iron. Sometimes they use electrolytic-process pure iron.

Many blacksmiths also incorporate materials such as bronze, copper, or brass in artistic products. Aluminum and titanium may also be forged by the blacksmith's process. Each material responds differently under the hammer and must be separately studied by the blacksmith.

iv) How to conserve: Despite the fact that metals are generally considered as the relatively permanent and stable materials, in contact with the environment they deteriorate gradually, some faster and some much slower.

Preventive conservation:

Metallic objects are sensitive to environmental conditions such as temperature, humidity, air pollution and exposure to light and ultraviolet light. They must be protected in a controlled environment where such variables are maintained within a range of damage-limiting levels.

v) Waste material management

vi) Other usages of the raw material like medicinal etc. (Ayurvedic connection)

MORE DETAILING CAN BE MADE AT A LATER STAGE

d) Designing involves fabricating according to the requirements of the customer.

i) Design and usage: The product must be designed according to the usage of the customer. The positioning of the product can be made better when the usage has been properly defined.

ii) Design and Aesthetics: Aesthetics is an important part of design. Regionally India has various designs of furniture, door frames, window frames etc. according to the architecture of that region. These things have to be kept in mind while designing the respective product.

iii) Technical aspects like Proportion: Proportion exists in forms; the size of each section must relate to the size of other sections in order to maintain balance and unity. Symmetry and Balance are other two elements to be considered in design.

iv) Brief History of design in the Indian and world context:

MORE DETAILING CAN BE MADE AT A LATER STAGE

e) Production: Blacksmiths work by heating pieces of wrought iron or steel until the metal becomes soft enough for shaping with hand tools, such as a hammer, anvil and chisel. Heating generally takes place in a forge fueled by propane, natural gas, coal, charcoal, coke or oil.

Some modern blacksmiths may also employ an oxyacetylene or similar blowtorch for more localized heating. Induction heating methods are gaining popularity among modern blacksmiths.

Color is important for indicating the temperature and workability of the metal. As iron heats to higher temperatures, it first glows red, then orange, yellow, and finally white. The ideal heat for most forging is the bright yellow-orange color that indicates *forging heat*. Because they must be able to see the glowing color of the metal, some blacksmiths work in dim, low-light conditions, but most work in well-light conditions. The key is to have consistent lighting, but not too bright. Direct sunlight obscures the colors.

The techniques of smithing can be roughly divided into forging (sometimes called "sculpting"), welding, heat-treating, and finishing.

Forging

Forging—the process smiths use to shape metal by hammering—differs from machining in that forging does not remove material. Instead, the smith hammers the iron into shape. Even punching and cutting operations (except when trimming waste) by smiths usually re-arrange metal around the hole, rather than drilling it out as swarf.

Forging uses seven basic operations or techniques:

- Drawing down

- Shrinking (a type of upsetting)
- Bending
- Upsetting
- Swageing
- Punching
- Forge welding.

These operations generally require at least a hammer and anvil, but smiths also use other tools and techniques to accommodate odd-sized or repetitive jobs.

Drawing

Drawing lengthens the metal by reducing one or both of the other two dimensions. As the depth is reduced, or the width narrowed, the piece is lengthened or "drawn out."

As an example of drawing, a smith making a chisel might flatten a square bar of steel, lengthening the metal, reducing its depth but keeping its width consistent.

Drawing does not have to be uniform. A taper can result as in making a wedge or a woodworking chisel blade. If tapered in two dimensions, a point results.

Drawing can be accomplished with a variety of tools and methods. Two typical methods using only hammer and anvil would be hammering on the anvil horn, and hammering on the anvil face using the cross peen of a hammer.

Another method for drawing is to use a tool called a fuller, or the peen of the hammer, to hasten the drawing out of a thick piece of metal. (The technique is called fullering from the tool.) Fullering consists of hammering a series of indentations with corresponding ridges, perpendicular to the long section of the piece being drawn. The resulting effect looks somewhat like waves along the top of the piece. Then the smith turns the hammer over to use the flat face to hammer the tops of the ridges down level with the bottoms of the

indentations. This forces the metal to grow in length (and width if left unchecked) much faster than just hammering with the flat face of the hammer.

Heating iron to a "forging heat" allows bending as if it were a soft, ductile metal, like copper or silver.

Bending can be done with the hammer over the horn or edge of the anvil or by inserting a bending fork into the Hardy Hole (the square hole in the top of the anvil), placing the work piece between the tines of the fork, and bending the material to the desired angle. Bends can be dressed and tightened, or widened, by hammering them over the appropriately shaped part of the anvil.

Some metals are "hot short", meaning they lose their tensile strength when heated. They become like Plasticine: although they may still be manipulated by squeezing, an attempt to stretch them, even by bending or twisting, is likely to have them crack and break apart. This is a problem for some blade-making steels, which must be worked carefully to avoid developing hidden cracks that would cause failure in the future. Though rarely hand-worked, titanium is notably hot short. Even such common smithing processes as decoratively twisting a bar are impossible with it.

Upsetting

Upsetting is the process of making metal thicker in one dimension through shortening in the other. One form is to heat the end of a rod and then hammer on it as one would drive a nail: the rod gets shorter, and the hot part widens. An alternative to hammering on the hot end is to place the hot end on the anvil and hammer on the cold end.

Punching

Punching may be done to create a decorative pattern, or to make a hole. For example, in preparation for making a hammerhead, a smith would punch a hole in a heavy bar or rod for the hammer handle. Punching is not limited to depressions and holes. It also includes cutting, slitting, and drifting—all done with a chisel.

Combining processes

The five basic forging processes are often combined to produce and refine the shapes necessary for finished products. For example, to fashion a cross-peen hammer head, a smith would start with a bar roughly the diameter of the hammer face: the handle hole would be punched and drifted (widened by inserting or passing a larger tool through it), the head would be cut (punched, but with a wedge), the peen would be drawn to a wedge, and the face would be dressed by upsetting.

As with making a chisel, since it is lengthened by drawing it would also tend to spread in width. A smith would therefore frequently turn the chisel-to-be on its side and hammer it back down—upsetting it—to check the spread and keep the metal at the correct width.

Or, if a smith needed to put a 90-degree bend in a bar and wanted a sharp corner on the outside of the bend, they would begin by hammering an unsupported end to make the curved bend. Then, to "fatten up" the outside radius of the bend, one or both arms of the bend would need to be pushed back to fill the outer radius of the curve. So they would hammer the ends of the stock down into the bend, 'upsetting' it at the point of the bend. They would then dress the bend by drawing the sides of the bend to keep the correct thickness. The hammering would continue—upsetting and then drawing—until the curve had been properly shaped. In the primary operation was the bend, but the drawing and upsetting are done to refine the shape.

Welding

Welding is the joining of the same or similar kind of metal.

A modern blacksmith has a range of options and tools to accomplish this. The basic types of welding commonly employed in a modern workshop include traditional forge welding as well as modern methods, including oxyacetylene and arc welding.

In forge welding, the pieces to join are heated to what is generally referred to as *welding heat*. For mild steel most smiths judge this temperature by color: the metal glows an intense yellow or white. At this temperature the steel is near molten.

Any foreign material in the weld, such as the oxides or "scale" that typically form in the fire, can weaken it and cause it to fail. Thus the mating surfaces to be joined must be kept clean. To this end a smith makes sure the fire is a reducing fire: a fire where, at the heart, there is a great deal of heat and very little oxygen. The smith also carefully shapes mating faces so that as they come together foreign material squeezes out as the metal is joined. To clean the faces, protect them from oxidation, and provide a medium to carry foreign material out of the weld, the smith sometimes uses flux—typically powdered borax, silica sand, or both.

The smith first cleans parts to be joined with a wire brush, then puts them in the fire to heat. With a mix of drawing and upsetting the smith shapes the faces so that when finally brought together, the center of the weld connects first and the connection spreads outward under the hammer blows, pushing out the flux (if used) and foreign material.

The dressed metal goes back in the fire, is brought near to welding heat, removed from the fire, and brushed. Flux is sometimes applied, which prevents oxygen from reaching and burning the metal during forging, and it is returned to the fire. The smith now watches carefully to avoid overheating the metal. There is some challenge to this because, to see the color of the metal, the smith must remove it from the fire—exposing it to air, which can rapidly oxidize it. So the smith might probe into the fire with a bit of steel wire, prodding lightly at the mating faces. When the end of the wire sticks on to the metal, it is at the right temperature (a small weld forms where the wire touches the mating face, so it sticks). The smith commonly places the metal in the fire so he can see it without letting surrounding air contact the surface. (Note that smiths don't always use flux, especially in the UK.) Now the smith moves with rapid purpose, quickly taking the metal from the fire to the anvil and bringing the mating faces together. A few light hammer taps bring the mating faces into complete contact and squeeze out the flux—and finally, the smith returns the work to the fire. The weld begins with the taps, but often the joint is weak and incomplete, so the smith reheats the joint to welding temperature and works the weld with light blows to "set" the weld and finally to dress it to the shape.

Finishing

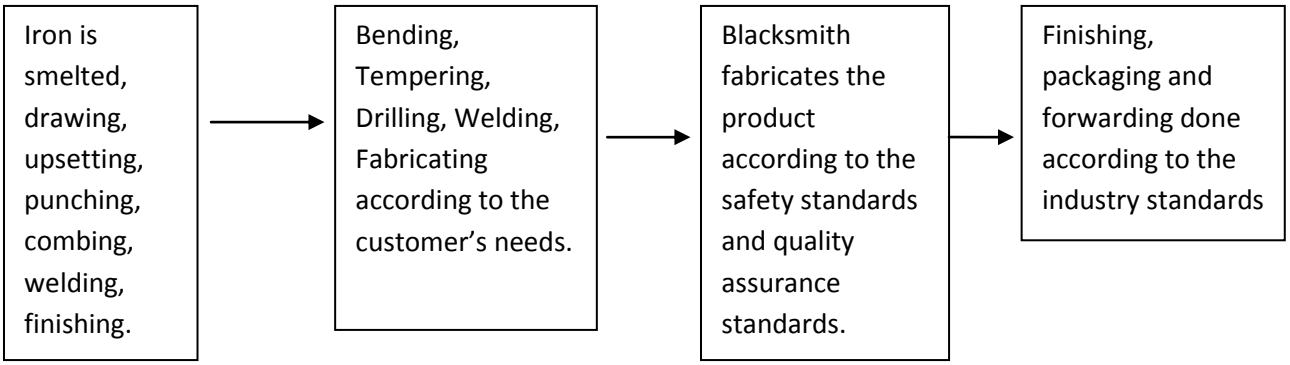
Depending on the intended use of the piece, a blacksmith may finish it in a number of ways:

- A simple jig (a tool) that the smith might only use a few times in the shop may get the minimum of finishing—a rap on the anvil to break off scale and a brushing with a wire brush.
- Files bring a piece to final shape, removing burrs and sharp edges, and smoothing the surface.
- Heat treatment and case-hardening achieve the desired hardness.
- The wire brush—as a hand tool or power tool—can further smooth, brighten, and polish surfaces.
- Grinding stones, abrasive paper, and emery wheels can further shape, smooth, and polish the surface.

A range of treatments and finishes can inhibit oxidation and enhance or change the appearance of the piece. An experienced smith selects the finish based on the metal and on the intended use of the item. Finishes include (among others): paint, varnish, bluing, browning, oil, and wax.

i) Raw material management at production site:

ii) Production line management



iii) Quality assurance

iv) Safety measures

v) Finishing and Packaging

MORE DETAILING CAN BE MADE AT A LATER STAGE

Sl. No.	Subject	Details	No. of hours CPT-CT101	No. of hours CPT-D101	No. of hours CPT-B101
1.	Introduction Orientation & Overview		6 hours	6 hours	6hours
2.	History	Brief history in the Indian and world context.			
3.	Tools	1. Hand Tools 2. Power Tools 3. How to use 4. How to make 5. How to service and maintain			
4.	Raw Material	1. List of Raw Materials discussed 2. How to harvest 3. When to harvest			

		4. Conservation **5. Waste material management** **6. Other usages**			
5.	**Designing**	**1. Design and usage** **2. Design and aesthetics** **3. Proportion, symmetry and balance** **4. History of design**			
6.	**Production**	**1. Raw material Management** **Smelting,** **Drawing,** **Upsetting,** **Punching,** **Combing,** **Welding,** **Bending,** **Tempering,** **Drilling,** **Fabricating**			

		Finishing **2. Production line management** **3. Safety measures** **4. Finishing and packaging** **5. Quality assurence**			
7.	**Marketing**	**1. Positioning** **2. Outreach** **3. Visibility** **4. Availability** **5. SCM & DSM**			
8.	**Post sale customer service**				
9.	**Waste and Effluent management**				
10.	**Entrepreneurship**				
11.	**Accountancy**	**1. General accounting** **2. Financial Accounting** **3. Management**			

		accounting 4. Auditing 5. Tax Accounting			
12.	Book Keeping	1. General book keeping 2. Single entry 3. Double entry 4. Day Book 5. Petty Cash			
13.	Costing				
14.	Financial planning and management				
15.	Cross integration of various disciplines				
	Total no of hours		1050 hours	2100 hours	3150 hours

Annexure 6 – Pottery and Terracotta

Over view: The art of pottery is probably as old as human history. No other art traces the story of human beings on this earth as clearly as pottery does. The tides of time have washed away many civilisations but evidence of their existence remains in fragments of pottery. There are two reasons why this is true: the first is that clay is found in abundance in practically all parts of the world; the second is that clay objects are the least perishable of all materials.

The sculpture and ceramics area supports students in their investigations ranging from utilitarian object-making traditions to interdisciplinary sculpture practice. Students have access to the entire art department's faculty and state-of-the-art facilities. This broad approach allows for cross-disciplinary, conventional, and experimental investigations. Students are encouraged to develop a body of work with a thorough understanding of its conceptual premise within the context of creative research and contemporary art. Innovative coursework challenges the critical and artistic skills of students at beginning and advanced levels. Through thoughtful discussion, critical examination, and rigorous evaluation of concepts and ideas, the area helps students situate their own practice within an understanding of its rich traditions. Beginning courses introduce concepts basic to the understanding of three-dimensional visual language, the use of materials, tools, and the creative process. Advanced courses provide the opportunity to develop strategies for professional studio practice, independent creative research, and a personal vision.

The University embodies values of community, hospitality and self-sufficiency as well as the University's commitment to the integration of art and life; the preservation of the environment; the linkage between work and worship; and the celebration of diverse cultures.

The University engages students, apprentices, and visiting artists in the work of artistic creation, discipline, and research and preparation of natural materials. These dynamic experiences are framed by questions of what it means to envision and create a sustainable lived system.

GENERAL INFORMATION

1. Name of the Course: Terracotta and Pottery Training.

2. Duration of Training :
1 Year (Two semesters each of six months duration). Craftsmen training
2 Year (Four semesters each of six months duration). Diploma
3 Year (Six semesters each of six months duration). Graduation

3. Subject covered: TRADE THEORY & TRADE PRACTICAL

4. Applicability: Terracotta and Pottery TRADE

5. Examination: To be held at the end of each semester.
6. Space Norms:
(a) One class room of minimum 30 sq.m. area having Minimum width of 5 m. and with 6000 lumen
(b) Workshop : 120 sq. meter having minimum width of 8 m. and with 30000 lumen
The electrical equipments of Class room should conform to minimum 3 star Building energy rating per Bureau of Energy Efficiency (B.E.E.)
7. Power Norms: (a) 1/2 KW for Class room
(b) 5 KW for Workshop
8. Unit strength (Batch Size): 20 Trainees
9. Entry qualification :
(a) 8th standard pass for 1 Year (Two semesters each of six months duration). Craftsmen training, 210 working days.
(b) 10th Standard pass for 2 Year (Four semesters each of six months duration). Diploma, 420 working days.
(c) 12th Standard or Pre-University or Pre-Degree pass for 3 Year (Six semesters each of six months duration). Graduation, 630 working days.

The training module will include the following.

a) A brief history of the trade both the Indian and world: The history of pottery tells of the daily life of human beings, their death and burial, of human

migration, trade and conquest, cultural practices and influences. As to the discovery of how clay could be manipulated to make pottery, it is easy to imagine how, as prehistoric communities walked through rain-soaked mud, they noticed their footprints and how these impressions became hardened by the wind and sun. Exactly when human beings intentionally used these discoveries for making pottery is unknown but it may have been invented independently in many parts of the world. However, the process of making a pot is a long and difficult one that has evolved over many generations of trial and experiment.

Work with the oldest of materials while making the newest form of art. Ceramics offers a world of knowledge, aesthetics, technical approaches and invention. Where active contact with other artists establishes a collaborative effort and encourages an open exchange of ideas.

b) Tools and implements used

Clay-Mixing

The mixing facilities have a number of options seldom found outside of industry including shearer and filter press, as well as those common to the studio ceramist such as blunger mixers, Soldner mixer, dough mixer, cement mixer, and de-airing pug mills, etc.

Wheels

The most important change came with the invention of the potter's wheel. There are many kinds of wheels used in India today. The first is a simple flat stone or wooden disc that is turned with the hand or a stick. By placing a soft lump of clay on the centre of the disc and turning the wheel the potter can change the shape of the clay. By varying the pressure of her/his fingers and palms she/he can create a pot of different sizes and shapes. By pushing with her/his thumbs down into the centre of the ball of clay and pulling gently outward and upward the shape of the hollow pot takes form.

Another type of wheel is mounted on a vertical shaft. By extending the shaft and adding another disc at the bottom it is possible to turn the wheel with the feet, leaving both hands free to make the pot.
Today even motorised wheels are used.

Kilns

The Firing Lab makes available as much breadth in process as possible from super high temperature test kiln or Wall-of-Burners to traditional kilns of all makes and sizes including that which can be loaded with a forklift. 10 Gas Kilns vary from 2 to 60 cu. ft., and are updraft, downdraft, soda, and raku, etc. 10 Electric Kilns ranging from small test or 16.5 cu. ft. oval to a frontloading. We also have an experimental kiln pad with an 18 cu. ft. catenary arch wood kiln.

Casting and Mould Making

The Mold Making lab is equipped with plaster lathes, band saws, vibrating table, vacuum chamber, and 20 cu. ft. drying boxes, etc. Our Casting Lab is equipped with blunger mixers, RAM press, Shop-made hydraulic test press, and Shimpo jigger/jollier, etc. We also have a MakerBot 3D Printer (Prints Plastic and Slip) and clean space for making and designing models.

Cut-Off Wires

Probably the most common ones have two hardwood handles at either end. Fishing line and uncoiled springs can also be used as cut-off wires.

These tools are useful in cutting large lumps of clay and also in removing thrown ware from the potter's wheel. When throwing off the mound, fishing line or other very flexible cut-off lines are preferred.

Fettling knives are used to trim away excess material and come in both hard-tempered (very stiff blades) and soft-tempered (easily bent) blades. Beth E Peterson

Fettling Knives

These thin-bladed knives come in either a hard temper or soft. The hard ones are inflexible, while the soft fettling knives are flexible and can be bent into desired angles and curves. They were first developed to remove the fettle (the ridge of material left where pieces of the mold join when a piece has been cast). They are also very useful for trimming slabs and thrown pots.

If you have both kinds of fettling knives, it is useful to add a band of paint or indelible marker on one of them so you can easily tell them apart.

Pottery tools called ribs, used for smoothing and shaping while throwing. Beth E Peterson

Ribs and Scrappers

Used in throwing, these tools can help shape and smooth pots as they are being formed on the wheel. They are also used in the Rib and Hand method of working with coiled pots.

Ribs come in a many different shapes and usually are made from hardwood or rubber.

Scrappers look a lot like ribs, but are lighter and used to smooth wet and soft leather-hard green ware. They come in a myriad of shapes and can be made of steel, rubber, or wood. Some potters use scrappers and ribs interchangeably for tasks.

Loop, ribbon and wire tools are helpful to potters.

Loop, Wire and Ribbon Tools

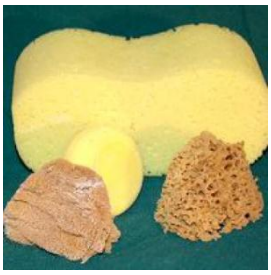
Just generally useful, these tools are handy for trimming green ware and for use in hand building. Wire and ribbon varieties are not recommended for use during throwing; they are too fragile.

An example of a very useful wooden modelling tool used for pottery.

Wooden Modelling Tools

Wooden modelling tools come in an astounding variety of shapes, useful in all sorts of hand building. Although called modelling tools, the triangular-headed varieties are also excellent trimming tools while throwing on the wheel.

Sponges Two examples of sponges suitable for pottery, one natural and one synthetic.



Largish natural or special synthetic sponges are used to absorb or distribute water during throwing. Many potters also use elephant ear sponges (a specific type of natural sponge) during the throwing process. For more information, check out

- Types of Pottery Sponges
- Uses of Sponges in Pottery

.**Brushes** Sumi brushes are excellent for working with clay

Brushes are used to carry water and slip to specific areas when you are working the clay, as well as used to paint and design with slips, underglazes, and overglazes. The

best brushes for ceramics and pottery are sumi, or bamboo, brushes. They can be loaded with a tremendous amount of fluid and still come to a nicely pointed end. Here's more about what brushes can do in pottery.

Calipers (Potter's Calipers)

Potters use this type of caliper to measure the inner and outer dimensions of pots where the y will meet with other parts of a working set. For example, they are especially useful when measuring lids for jars, measuring the base of a cup to match with the depression in the center of a saucer, or to measure the base of a pitcher that is matched with a the interior floor of a basin.

Calipers can be made of metal, wood, or plastic. Lid Master calipers do not have to be reversed and adjusted the way regular potter's calipers do.

The Box

Many of the potter's tools are fairly small and easy to misplace. Most potters I know use some form of box to keep their tools in for organization and accessibility. Heavy-duty plastic artist or tackle boxes tend to be the best if you are transporting tools. Otherwise, solutions can range from a utensil tray to any waterproof box. Cardboard boxes shouldn't be used, since the water and wet clay break them down too rapidly.

You can have more than one box, of course. As you can see, I have two main boxes: a cloth-covered plastic box with handles that stays by my wheel, and a utensil tray for my hand building tools.

i) Handling tools

ii) How to make them or get them made

iii) Servicing and maintenance

MORE DETAILING CAN BE MADE AT A LATER STAGE

c) Raw Material

Clay is universally found as it forms part of the earth's crust that developed due to weathering over thousands of years. In India different types of clay are found along riverbeds and banks, lakes and ponds, and agricultural lands. Clay is essentially silica but the varying mineral content in clay adds to its colour and determines how suited it is for different processes. Clay is cleaned by removing large stony particles, gravel and humus.

When clay is mixed with water it becomes malleable, elastic. Thinner clay solutions can be created to use as paint for walls and on sculptures. By controlling the amount of water that is mixed with clay it can be used in different ways.

♦ It can be made into a creamy compound that can be poured into moulds and allowed to set.

♦ It can be mixed to a leathery consistency and cut like a sponge.

♦ When dry the surface can be scraped off as fine powder.

♦ Straw and grass can be added to create a strong, rough texture ideal for the creation of very large images.

So each artist treats clay differently to suit the type of object that is to be created.

i) How to harvest clay: One of the most abundant materials on earth, clay can be found almost anywhere such as areas where the ground has broken into a bark like pattern (as on a tree) or areas where water tends to stay longer after a rain

Some examples are : stream banks, construction sites, roadway cuts, and any place that gets slippery after a rain and sticky as it starts to dry. When dry, it is nearly rock-hard. Clay can be extracted from many of these sources quite easily, and whether the plan is to use it for pottery or one of the multitude of other traditional uses, the goal is to remove as many impurities as possible and the process is the same. While some clay deposits are pure enough to be used

raw straight out of the ground, these are the exception; most clay is found in conjunction with sand.

ii) When to harvest (The astrological connection)

iii) How to use: If the clay is very workable, it may be used as it is. But usually processing is needed to remove extraneous matter. The following would be the process to do so:
Dry the clay completely (on boards, plaster bats, etc. Break it up into very small (pea-size) pieces, using a hammer. Pour into a container as much water as there is clay, then sprinkle the clay into the water. Stir, adding more water to make a liquid mass. Let sit for at least a few hours (or weeks), then stir well and sieve through a sieve or window screen. Add enough water to keep the mixture moving through. Leave to settle in the container, then pour off extra water. Do this until the mixture is mud-like, then spread on plaster bat or board to stiffen up. When mixture is stiff enough to roll, fold and knead it on a plaster, wood or canvas surface. (This process is called *wedging*.)

iv) How to conserve: To store, wrap tightly in several layers of plastic and place in a bag that is tightly closed. If the clay is too plastic or sticky, you may add sand, grog, finely ground shells or other materials to make it more workable. Clay may be dampened when stiff, and rewrapped and recycled. The clay may become more plastic with time.

v) Waste material management:

vi) Other usages of the raw material like medicinal etc. (Ayurvedic connection): The use of **medicinal clay** in folk medicine goes back to prehistoric times. Indigenous peoples around the world still use clay widely, which is related to geophagy. The first recorded use of medicinal clay goes back to ancient Mesopotamia.

A wide variety of clays are used for medicinal purposes—primarily for external applications, such as the clay baths in health spas (mud therapy). Among the clays most commonly used are kaolin and the smectite clays such as bentonite, montmorillonite, and Fuller's earth.

MORE DETAILING CAN BE MADE AT A LATER STAGE

d) Designing

i) Design and usage: The product must be designed according to the usage of the customer. The positioning of the product can be made better when the usage has been properly defined.

ii) Design and Aesthetics: Aesthetics is an important part of design. Regionally India has various designs of furniture, door frames, window frames etc. according to the architecture of that region. These things have to be kept in mind while designing the respective product.

iii) Technical aspects like Proportion: Proportion exists in forms; the size of each section must relate to the size of other sections in order to maintain balance and unity. Symmetry and Balance are other two elements to be considered in design.

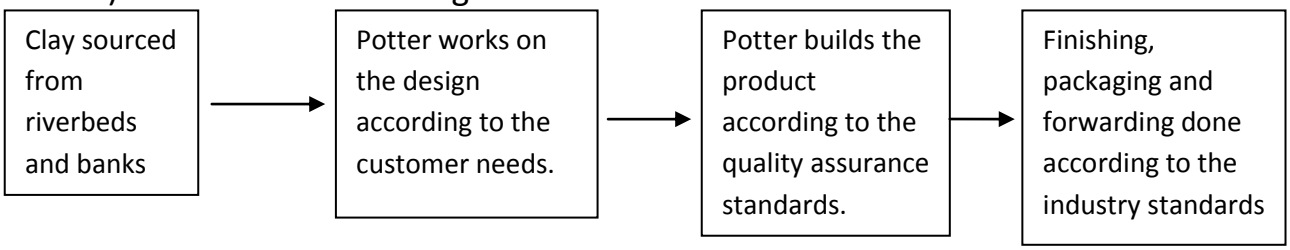
iv) Brief History of design in the Indian and world context

MORE DETAILING CAN BE MADE AT A LATER STAGE

e) Production

i) Raw material management at production site

ii) Production line management



iii) Quality assurance

iv) Finishing and Packaging

MORE DETAILING CAN BE MADE AT A LATER STAGE

Sl.	Subject	Details	No. of	No. of	No. of

No.			hours CPT-TP101	hours CPT-D101	hours CPT-B101
1.	Introduction Orientation & Overview		6 hours	6 hours	6hours
2.	History	Brief history in the Indian and world context.			
3.	Tools	1. Hand Tools 2. Power Tools 3. How to use 4. How to make 5. How to service and maintain			
4.	Raw Material	1. List of Raw Materials discussed 2. How to harvest 3. When to harvest 4. Conservation 5. Waste material management			

		6. Other usages			
5.	Designing	1. Design and usage 2. Design and aesthetics 3. Proportion, symmetry and balance 4. History of design			
6.	Production	1. Raw material management 2. Production line management 3. Safety measures 4. Finishing and packaging 5. Quality assurence			
7.	Marketing	1. Positioning 2. Outreach 3. Visibility 4. Availability 5. SCM & DSM			
8.	Post sale				

	customer service				
9.	Waste and Effluent management				
10.	Entrepreneurship				
11.	Accountancy	1. General accounting 2. Financial Accounting 3. Management accounting 4. Auditing 5. Tax Accounting			
12.	Book Keeping	1. General book keeping 2. Single entry 3. Double entry 4. Day Book 5. Petty Cash			
13.	Costing				
14.	Financial planning and management				
15.	Cross integration of various				

	disciplines				
	Total no of hours		**1050 hours**	**2100 hours**	**3150 hours**

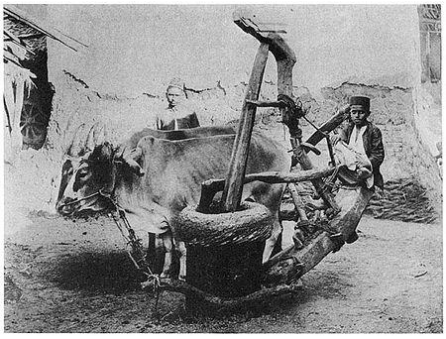
Annexure 7 – Cold Pressed Oil Extraction

Overview:

The oil is obtained through pressing and grinding fruit or seeds with the use of heavy granite millstones. Although pressing and grinding produces heat through friction, the temperature must not rise above 120°F (49°C) for any oil to be considered cold pressed. Cold pressed oils retain all of their flavor, aroma, and nutritional value. Olive, peanut and sunflower are among the oils that are obtained through cold pressing.

The Stone – Log Oil Extractor (Ghanna) has been a part of every village in India. The people India used only cold press oils till the oil mills happened.

a) Brief History of trade both the Indian and World Context:



For thousands of years, fats and oils have been important in food preparation in India. Metal frying pans that are remarkably similar in design to those used today have been found in archaeological excavations of the Harappan civilization of circa 2000 BC. A number of oleaginous materials such as sesame, rape and mustard seeds and coconut were known sources of oil (Achaya, 1990). In addition, a variety of animal fats were used. However, the exact way that oil was obtained from oilseeds is uncertain.

In Sanskrit literature of about 500 BC there is a specific reference to an oil-press, although it was never described (Monier-Williams, 1899). Juices were extracted from vegetable materials as early as 1500 BC using either a mortar and pestle or a grinding stone working on a flat stone. Linguistic evidence suggests that it is from these two crushing systems that presses for both oilseeds and sugar cane developed in the form of a mortar-and-pestle arrangement powered by animals. This system Is commonly called the ghani, or the kolhu or chekku (Achaya, 1993).

Ghani operation has been noted in Afghanistan, Sri Lanka and Myanmar, which had cultural ties with India. The device is widely used in the Sudan to crush sesame seeds, though its antiquity there has not been documented. Despite subsidies by the Indian Government to support village industries, in recent times ghani operation has declined precipitously in the land of its origin.

The oilseeds and subsequently the expressed oil are held in a scooped circular pit in the exact centre of a circular mortar made of stone or wood. In it works a stout, upright pestle which descends from a top curved or angled piece, in which the pestle rests in a scooped-out hollow that permits the pestle to rotate, eased by some soapy or oily lubricant. Today the single angled piece takes the form of two shorter pieces pinioned or chained together. The bottom of the lower angled piece is attached to a load-beam; one end of the load-beam rides around the outside of the barrel, while the other is yoked to the animal. The load-beam is weighted down with either heavy stones or even the seated operator. As the animal moves in a circular ambit, the pestle rotates, exerting lateral pressure on the upper chest of the pit, first pulverizing the oilseed and then crushing out its oil.

Within India there are regional variations in ghani design (Patel, 1943;Chaudhuri and Selvaraj, 1985), which probably arose from the nature of the oilseeds that were regionally available for crushing. The large granite ghanis of southern India have a capacity of 35 to 40 kg, requiring two animals yoked side by side and two operators, one for the animals and the other near the mortar. The load-beam is very long and curved and rides on a strong outer groove on the mortar. These ghanis have a life of four to five years, after which the pit is too worn to be useful. The wooden ghani of western India has a capacity of 8 to 15 kg, has an oil outlet at the base of the pit (which is kept plugged during crushing) and frequently has the operator seated on the load-beam. The Bengal ghani has a small capacity of only 5 to 10 kg per charge and is usually used to crush a mixture of rape and mustard seeds to yield a bouquet of flavours. The pit is small and the pestle is tall and has a stout base. The operation is prolonged so as to permit slow enzymatic liberation of several pungent alkyl isothiocyanates from the precursor glucosinolates in the prevailing warm, moist conditions. Punjab ghanis are of similarly small capacity but generally carry a short pestle.

At the beginning of the twentieth century, there were an estimated 500 000 ghanis in India which crushed 97 percent of all oilseeds (Achaya, 1990). The remaining 3 percent, mostly rape and mustard seeds, coconut and groundnuts, were processed in rotary units which were no more than mechanized ghanis

installed in factories. Virtually all the oil used in the country, about 800 000 tonnes, was processed by ghanis. These numbers dropped sharply as power-driven screw-presses, hydraulic presses and solvent-extraction units came into operation. A further switch to rotaries for rape and mustard seeds and coconut, and to expellers for groundnuts and castor beans, rapidly brought down ghani usage for all oilseeds to 40 percent in the 1930s and 28 percent in the 1940s (Achaya, 1990).

In the 1930s, Mahatma Gandhi inspired the formation of an organization devoted to the resuscitation of village industries, including oilseed crushing, which is now called the Khadi and Village Industries Commission (KVIC). This organization has steadily evolved a succession of improved oilseed crushing devices. The first of these, the Wardha ghani, was still worked by animals, but it was followed by several units that employed electric power for traction: the rotating barrel power ghani, the overhead power ghani, the portable power ghani and the portable overhead power ghani. Assistance by way of loans for both capital and working expenditure is granted by the KVIC both to individuals and to cooperative organizations to modernize traditional ghanis with power-driven pestles or to install the new power ghanis.

By the mid-1950s the number of ghanis had fallen to 300 000, and in 1983, despite the efforts of the KVIC, the figure was placed at 100 000 to 150 000 (Achaya, 1990). About 60 000 units were beneficiaries of KVIC assistance, of which 37 percent were traditional ghanis, 50 percent earlier forms of the power ghani and 13 percent later designs.

At present, just 4 percent of all oilseeds are pressed in ghanis. The proportions of individual oilseeds crushed in ghanis have been estimated as follows: safflower seeds, 40 percent; sesame seeds, 24 percent; rape and mustard seeds, 6 percent; groundnuts, 2.5 percent; and copra, 1 percent (Achaya, 1993). The major drawback is the low production capacity of ghanis. Even modern ghani units can press 100 kg of oilseeds per working day at best. As long as the present subsidies, such as exemption of sales tax on ghani oil, are retained as a measure of commitment to village industries, ghani operations can be expected to survive.

When ghani crushing was widespread, fresh oil was in greater demand than it is today. Flavour, which was traditionally an important attribute of all oils, and particularly of rape and mustard, coconut, groundnut and safflower oils, was best in oils produced from mild ghani crushing. Both storage quality and nutritive value were perceived as being high, although this is not borne out by

modern studies. Today homemakers, especially in urban areas, demand bland and refined packaged oils.

Since vegetable oils are naturally sterile, problems of hygiene in ghani oil are unlikely. Turnover of oil in the home is so rapid, and usage of oil in India so low, that oxidative and lipolytic deterioration resulting from storage is also insignificant. Ghani cake is known to be exceptionally hard and dry and is not prone to mould infestation unless inadvertently wetted.

However, the ghani has disadvantages which are mainly economic in nature. Traditional ghanis have a maximum capacity of about 50 kg per day, and modern powered units only about twice that much. As a result, running costs are disproportionately high. If animals are used, they need to be trained, and they are expensive to feed. Artisan training is also essential. Ghani oilcake as prised out of the unit after crushing is extremely hard and is not accepted by the trade for further solvent extraction, as are expeller oilcakes.

In ancient times, ghani crushers in India were recorded as being a separate caste, and this distinction still persists (Bose, 1975). Since the start of the twentieth century, as the demand for ghani oil has dropped sharply, younger people have shifted to more remunerative occupations, turning away from ghani crushing as they have from many other artisanal activities in a rapidly changing social, technological and economic environment.

Use of ghani crushing in India has probably stabilized at the current level of subsidized operations. In the future, power-driven devices are certain to displace traditional ghanis worked by animal traction. There may still be room for powered ghanis in India and perhaps even in other developing countries with limited local supplies of raw materials for oilseed extraction, and there may be a place for batteries of power ghanis to multiply oil output from a common shaft in factory operations.

b) **Tools and implements used:**

Ghani – an oil mill, made out of wood, *Lota* – a cup vessel used to collect oil, *Bail* (Bullock) – to run the *ghani*.

1. Primitive *Ghani* – This is one of the oldest *Ghani*, which consisted of two parts. A big log of wood

with a hole in the middle. This log was fixed in the ground. The oil seeds were put in the hole. A long pestle with a bow like structure on top of it, which was quite heave would be placed into this hole and turned around. This would grind the seeds and the old would come on top. This oil was collected by dipping a cloth into this hold and squeezing out the oil from the cloth into a vessel.

2. Improved *Ghani* – Heavy tamarind wood was used. A big log was fixed in the ground with a hole in it. Seeds would be put into this hole. A thick and heavy wooden rod would be placed into the hole and connected to a spoke, which would just touching the wooden log in the ground. This wooden spoke would have a yolk connected to it and this yolk would be turned around by a bullock. The eyes of the bullock would be covered, as they would go dizzy. As bullock turned around, the central wooden structure would move inside, grinding the seeds and removing the oil, which would come on top and this oil would be siphoned out.
3. More Improved *Ghani* – Here, all the structures remained same as above, but in this ghani, the oil was extracted from the bottom.

This tool is called Stone and Log Oil Extractor Ghani, Kohlu, Chetti, Ghana etc. Oxen are tied to a Log Press. As the Oxen move in a circle, the Log Press slowly rotates causing the seeds to be ground at low temperatures.

For the mortar, the trunks of hard woods such as the tamarind tree (*Tamarindus indica*), neem (*Azadirachta indica*), *jack* (*Artocarpus heterophyllus*), baheda (*Terminalia bellirica*), shirish (*Albizia lebbeck*) and sal (*Shorea robusta*) have been utilized regionally, all these being very large trees (Patel, 1943). Pit designs also vary with region, and could even take the form of a wooden sleeve that sits snugly in the cavity and is less expensive to replace (Patel, 1958). Even wooden strips laid radially in the pit cavity are in use. The pestle is generally made of baheda, shirish or babul (*Acacia nilotica*) wood,

with a bulbous tip sometimes clad with lengthwise metal strips. The shape and design of the pestle end must match that of the pit to avoid excessive dead space (Nag, 1982). The curved or angled piece was once fashioned out of a single large piece of wood; a shortage of these has led to the use of two pieces, the top one angled or curved and the bottom one straight; these are tied, chained or pinioned together for easy detachment when the pestle has to be removed. The strong load-beam has to be designed so that lateral pressure on the animal does not force it to lean from a comfortable upright stance during ambulation. Trained male animals, cattle or buffalo, are generally used, usually blindfolded to avoid dizziness and distraction; however, on small ghanis in certain areas even human labour, both of men and women, is employed (Achaya, 1993).

1. **How to make them or get them made:**
2. **Servicing and maintenance of Tools:**

c) **Raw Material:**

Oil Seeds like peanut, olive, sunflower, sesame, mustard, cotton seed, safflower, flaxseed, almond, coconut, walnut, marotti, neem, simaruba, pongemia, castor and various others.

1. **How to harvest:** Different oil seeds would be harvested at different times of the year.
2. **When to Harvest:** The Oil Seeds can be harvested in every season

3. **How to use:** Many oils are marketed as first cold pressed or cold extraction. "Cold" refers to the fact that no heat is added during extraction. "Pressed" refers to the concept that the olives are crushed in a mill to extract the oil. The temperature of malaxation and extraction is crucial due to its effect on olive oil quality. When high temperatures are applied the more volatile aromas are lost and the rate of oil oxidation is increased, producing therefore lower quality oils. In addition, the chemical content of the polyphenols, antioxidants, and vitamins present in the oil is reduced by higher temperatures.

4. **How to conserve:** Oils have been around for thousands of years. The refrigerator did not exist until recently so it is not necessary to keep oils in the refrigerator. The exceptions are flaxseed, hempseed and Bio Alpha + oils because they contain omega-3 polyunsaturated fats that are susceptible to oxidation. Good quality first cold-pressed oils can be stored for an average of 18 months in a cool dry place away from light. Again, oils rich in omega-3 are the exception. Their shelf life in a sealed bottle is 4 months for flaxseed and 9 months for Bio Alpha + and hempseed. Once opened, flaxseed and Bio Alpha + oils must be consumed within 4 weeks.

5. **Waste Material Management:** all the dry cakes can be used as either fodder for cattle or for making compost for agriculture purpose.

6. **Other usages of raw materials like medicinal etc.**

d) Production

In the crushing of 10 kg of sesame seed in a ghani, about three-fourths of the material is placed in the pit and the rest is evenly laid out all around the flat rim (Patel, 1943; Nag, 1982). The animal is prodded and allowed to perambulate for a few minutes until pulverized seed is found to climb the walls of the pit. The animal is halted, and 180 ml of water is sprinkled around the

chest and 120 ml poured into the pit. A further 5 minutes of pestle rotation will cause about three-fourths of the seed to be pulverized, after which another 300 ml of water is poured evenly around the pithead. The material built up in the chest is raked using a crowbar, and the pieces are broken up by hand and cast into the pit. After the animal has resumed movement, the rest of the seed is evenly pushed in all around. The operator now tests the solid material by balling it in his or her palm; if it crumbles too easily, more water is needed. The layer of built-up material is again broken up, and brisk ambulation is resumed. After about 45 minutes, a sudden release of frothy oil floods the surface. Another 100 ml of water is sprinkled over the oil, the animal is stopped and the oil is allowed to settle. A final quantity of about 20 ml of water is now brushed over the compacted cake surface using the edge of the palm, after which the animal makes a few more rounds. The operation is stopped, the two curved pieces are detached and the pestle is lifted out and laid aside. If the ghani has a drainpipe, it is unplugged and the oil is drawn into a vessel. Otherwise the oil released into the pit is mopped up with a piece of cloth and wrung out by hand into vessels. While the cake is still hot and before it has set really hard, it is prised out as thick slabs from the chest using a crowbar.

Rape and mustard seeds need more water during crushing than sesame, and copra rather less. The oilcake is not raked during linseed crushing, but only at the very end. Safflower seeds are always very carefully decorticated by passage between grinding stones, sieving and winnowing: only practically pure meats are subjected to ghani crushing. During crushing of groundnuts at least part of the shells are retained in the ghani so as to ensure formation of a granular and compact cake.

At the point of maximum contact, the pressure in a ghani is about 10 kg/cm^2 (Gujarathi, 1982), about one-third of that in a small screw-press and about one-tenth to one-hundredth of that in a large modern expeller. The pressure in the ghani is largely determined by the weight placed on the load-beam, usually 115 to 160 kg, which is transmitted by way of the curved piece to the top of the pestle.

The fit of the pestle within the pit is important. Experiments have shown that an inclination that exceeds 21° from the perpendicular causes so much lateral pressure that the mass will not climb the walls of the pit. Too much dead space in the pit will have the same effect.

The phased additions of about 7,5 percent water during ghani operation have a major role. The first addition provides the pestle with a grip on the dry oilseed,

and the friction produces heat. The second portion, with the heat present, cooks the ground seed. This is analogous with what happens in the stack precooker in modern screw-press operation. Protein is denatured and coagulated, and as the moisture level reaches a critical point, oil is rather suddenly displaced from the cells. (In the Russian Skipin process, in which oil is extracted by displacement with hot water, this critical moisture level has been ascertained to lie within the limits of 14 to 18 percent (Alderks, 1948)). The cake at this stage turns granular and cohesive, and will not reabsorb the expelled oil. After the oil has appeared, the third addition of water serves to hydrate and coagulate gums and phospholipids. This phase is analogous to modern oil degumming. The last brushing with water serves to clear surface oil on the cake and give it a sheen.

An oil-rich seed such as sesame seed or groundnut yields about 5 percent less oil in a ghani than in a modern expeller, mainly because of insufficient pressure. Ghani oilcake carries about 15 percent residual fat, about twice that of screw-press oilcake (Achaya, 1993). In fact, in modern commercial Indian practice oilcake produced by crushing rape and mustard seeds in the ghani is put through screw-presses to obtain about 2 percent oil; this is added to the pungent ghani oil already obtained, to raise total yield.

1. Raw Material Management at Production Site
2. Production Line Management
3. Double Filtering and Refining for some oils
4. Finishing and Packaging
5. Quality Assurance

Sl. No.	**Subject**	**Details**	**No. of hours** **CPT-CT101**	**No. of hours** **CPT-D101**	**No. of hours** **CPT-B101**
1.	**Introduction** **Orientation &** **Overview**		**6 hours**	**6 hours**	**6hours**

2.	**History**	**Brief history in the Indian and world context.**			
3.	**Tools**	**1. Hand Tools** **2. Power Tools** **3. How to use** **4. How to make** **5. How to service and maintain**			
4.	**Raw Material**	**1. List of Raw Materials discussed** **2. How to harvest** **3. When to harvest** **4. Conservation** **5. Waste material management** **6. Other usages**			
6.	**Production**	**1. Raw material management** **2. Production line management** **3. Safety**			

		measures **4. Finishing and packaging** **5. Quality assurence**			
7.	**Marketing**	**1. Positioning** **2. Outreach** **3. Visibility** **4. Availability** **5. SCM & DSM**			
8.	**Post sale customer service**				
9.	**Waste and Effluent management**				
10.	**Entrepreneurship**				
11.	**Accountancy**	**1. General accounting** **2. Financial Accounting** **3. Management accounting** **4. Auditing** **5. Tax Accounting**			

12.	**Book Keeping**	**1. General book keeping** **2. Single entry** **3. Double entry** **4. Day Book** **5. Petty Cash**			
13.	**Costing**				
14.	**Financial planning and management**				
15.	**Cross integration of various disciplines**				
	Total no of hours		**1050 hours**	**2100 hours**	**3150 hours**